

Vol. II.
TRANSCRIPT OF RECORD.

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1923

No. 120

THOMSON SPOT WELDER COMPANY, PETITIONER,

vs.

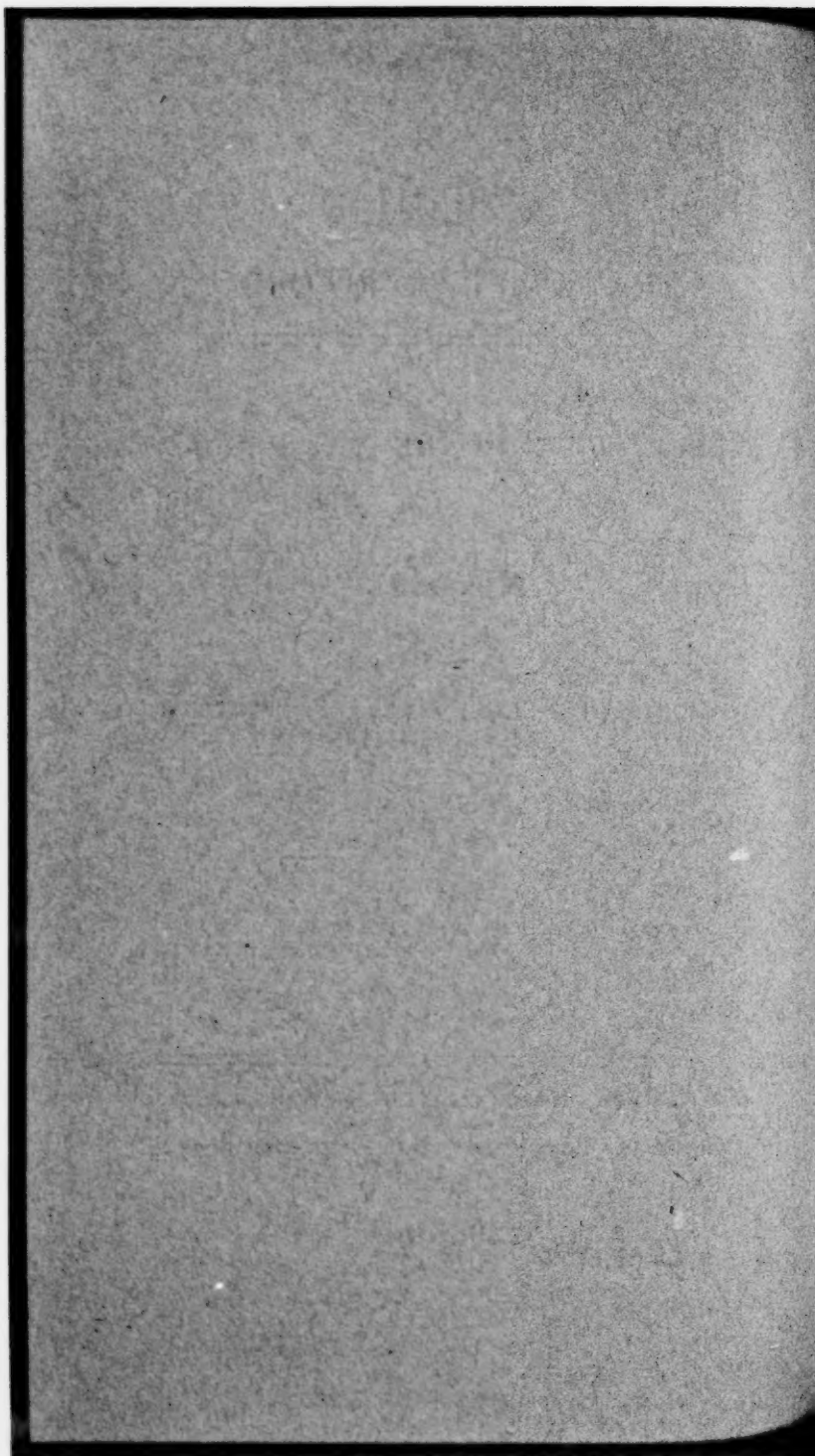
FORD MOTOR COMPANY.

**ON WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT
OF APPEALS FOR THE SIXTH CIRCUIT.**

PETITION FOR CERTIORARI FILED SEPTEMBER 12, 1922.

CERTIORARI AND RETURN FILED DECEMBER 13, 1922.

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FORD MOTOR COMPANY.

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VOLUME II.

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IN THE DISTRICT COURT OF THE UNITED STATES
FOR THE EASTERN DISTRICT OF MICHIGAN

SOUTHERN DIVISION

THOMSON SPOT WELDER COMPANY, Plaintiff,

vs.

FORD MOTOR COMPANY, Defendant.

In Equity, No.

Before Hon. John M. Killits, District Judge for the Northern District of Ohio, sitting by designation at Detroit, Michigan.

Monday, May 19th, 1919. 10 A. M.

F. P. McBERTY, after being duly sworn on behalf of the defendant, testified as follows:

(Mr. Church: Your Honor will understand there are quite a few defenses to be presented in this case; on this occasion we will only take testimony on the question of prior use. We have witnesses for that purpose and we will proceed at once.)

(The Court: Very well.)

Direct Examination by MR. CHURCH:

Question 1. Please state your name, age, residence and occupation.

Answer. F. P. McBerty; residence at Warren, Ohio; occupation, mechanical and electrical engineer; I am 50 years old.

Q. 2. How long have you lived at Warren, Ohio?

A. All my life.

Q. 3. You were at one time connected with the Warren Electric and Specialty Company of Warren, Ohio, were you not?

A. Yes, sir, I was.

Q. 4. How long were you connected with that company?

A. I was connected with that company from 1898 until 1906.

Q. 5. What did the Warren Electric and Specialty Company manufacture while you were with it?

A. Incandescent lamps, transformers, desk fan motors and ceiling fan motors.

Q. 6. What was your position with that company?

A. Superintendent.

Q. 7. What types of fans were manufactured and put out by the Warren Electric and Specialty Company while you were there?

A. The fan known as the electric desk fan and ceiling fans.

Q. 8. What type of desk fan did they manufacture, or principally manufacture and put out at that time?

A. They produced a small electric desk fan of high grade quality, constructed of iron, steel and brass.

Q. 9. Of what material were the blades and guards constructed at that time?

A. At first they were made entirely of brass.

Q. 10. Was a cheaper fan ever put out by the Warren Electric and Specialty Company, while you were with them?

A. There was.

Q. 11. Generally speaking, what was there about that cheaper fan that made it cheaper?

A. We reduced the cost of production by incorporating in the construction of the blades and guards steel instead of brass formerly used.

Q. 12. About how much less was the selling price of this cheaper fan than the ordinary product?

A. That is rather difficult for me to say, on account of my not having detailed knowledge of the selling prices, but somewhere between \$3 and \$4 less per fan, for the small type.

Q. 13. When was this cheaper steel bladed fan of which you speak first put out by the Warren Electric and Specialty Company?

A. It was first put out in the fan season of 1901.

Q. 14. Who designed that fan?

A. I did.

Q. 15. I show you a pamphlet and ask you to state if you know what it is?

A. This is a catalog of the Warren Electric and Specialty Company's fans, which apparently was put on the market during the season in which this catalog was produced.

Q. 16. What season was that?

A. This is the 1900 catalog.

Q. 17. That catalog which is marked, I think, Defendant's Exhibit No. 1, 1900 catalog, of the Warren Electric Specialty Company, having been previously offered in this case, purports on its face to be a catalog of the Warren Electric and Specialty Company of 1900, does it not?

A. The date is not apparently on this catalog.

Q. 18. I draw your attention to the second page of this catalog, which reads in part: "It is with considerable degree of pride and satisfaction that we present for the season of 1900 three new designs of direct current motors" etc. Does that matter enable you to state what season that was?

A. That identifies it as being the catalog that was issued in the year 1900.

Q. 19. Will you please take that catalog of 1900 and referring

to one of the cuts of a fan therein, and point out the names to the Court of the various parts of the fan, in order that the Court may get an idea of the terminology used by fan makers.

A. This cage is what we call the fan guard, and encloses the blades in a sort of wire netting. You see it here. It is illustrated on page 9, rear view of the fan blades, and you will see illustrated here what we call the spider or center for supporting the fan blades on the motor shaft. You have another illustration of the same thing on page 10. Those are the narrow projections from the shaft on which the blades are fastened. Then another illustration is on page 12. It indicates the fan blades fully assembled, but not in position on the armature. The upper cut shows that,

Q. 20. Then the essential parts of the fan which you are undertaking to describe are: first, the shaft, then there is the center or spider on the shaft, and this has a number of radiating arms, and to those radiating arms are connected the fan blades. Is that correct?

A. Yes, sir.

Q. 21. Of what materials were the fan blades and spiders composed in this fan shown in the 1900 catalog?

A. These were all brass, both fan blades and centers.

Q. 22. How are the brass fan blades fastened to the centers or spiders?

A. They are riveted in position.

Q. 23. Will you explain the process that was resorted to in fastening the blades to the centers or spiders in 1900?

A. The center itself, consisting of either brass casting or built up strips, was punched or drilled, ordinarily drilled, giving certain distances between the holes, and these holes were slightly larger than the rivets to be inserted. The blades were blanked or punched out of brass sheets, and the second operation performed on them was to punch the holes, corresponding to the holes in the center or spider. The blade was then curved to correspond to the proper shape to give the required output of wind, after which it was put in position on the center or spider, rivets put into position, the head of the rivet being placed on a small handle or block, the end projecting through the blade was turned over or spread out by a few blows of a light hammer, and finished with a rivet set, so-called, which rounded up the head.

Q. 24. Will you now explain how in the case of the brass bladed fans shown in the 1900 catalog the guard wires, were constructed?

A. The guard wires on the fan illustrated on page 5, which are of brass, are fastened into the rear or supporting ring, which is a small square brass rod or ring, by having their ends turned down to form a tenon. A hole is drilled through the ring to make a neat fit on this tenon, the wire is pushed into place to bring it against the shoulder, and the projecting end which stands a slight distance beyond the back of the ring and is smoothed over, smoothed off

with a file. The inside end of that top or guard was clamped in position back of the name plate of the brass casting, bending over small brass lugs.

Q. 25. Have you stated how the ends of the rings were fastened?

A. The ends of our rings were fastened in different ways. On square rings some of them were fastened by bringing the abutting ends together, slipping in position a metal sleeve covering this joint. Then with the aid of solder the sleeve was firmly soldered in position. That was one way. That was done both with the square and the round wires. Another method was to mill off or machine off half of the square wire for a short distance back from the end milling off on the abutting ends half on the two opposite sides, so as to make a lap. This lap when fitted was approximately the same dimension as the balance of the wire or ring. Two holes were then drilled through, a small pin or rivet put through, and finally soldered to fill up any inequalities of the joint. Another way consisted of attaching the round wires by drilling a hole in each end of the wire where they came together and inserting a small pin a short distance, which gave the proper alinement to the abutting end, and this joint was then soldered to fill it up and make it smooth.

Q. 26. How are we to understand the riveting was done so as to uniting the blades to the spider or center of the 1900 fan, by hand or machine?

A. This was by hand.

Q. 27. Coming now to the cheaper steel bladed fan, which you say was designed by you, please tell us how, if at all, it was differently put together from the brass bladed fan shown in the 1900 catalog?

A. The fan blade you are referring to or the guard. The guard, to start with, which consisted of iron rings in place of brass rings previously used, were electrically welded together at the abutting ends.

Q. 28. How were the fan blades secured to the spiders of those steel bladed fans?

A. By electric spot welds.

Q. 29. Before you began work on this steel bladed fan, what, if anything, did you know of electric welding?

A. Comparatively little.

Q. 30. State to the Court what knowledge you had acquired and where you had obtained it.

A. I had read some descriptions of butt welders, known as the Thomson butt welder, and had acquired quite a little information along the same line in conversation with one of our men employed there, or as I would say, an electrical engineer.

Q. 31. Give his name.

A. Mr. Edward B. Craft.

Q. 32. Is this Mr. Craft living?

A. He is.

Q. 33. Where is he, and what is his business?

A. The last time I saw Mr. Craft he was in the office of the Western Electric Company at New York City and my impression is he was superintendent of the new development work or in charge of the new development work, telephone work, as an electrical engineer.

Q. 34. When you first started in to construct this steel-bladed fan, how did you think you could apply the electric welding process?

A. By butt welding my guards together.

Q. 35. What steps, if any, did you take to carry out your idea of electrically welding the guard wires of the new steel-bladed fan?

A. I designed an electrical butt welder and built it or had it built.

Q. 36. Please describe generally the construction of that machine by which you did butt weld the rings or guards?

A. It consisted of two angles made of cast iron attached to each other in such a manner as to be flat or level on top, insulating material being placed between the two angles, so as to prevent the flow of current from one angle to the other, and mounted on top of this two small swinging arms; these arms being arranged to move through a short portion of an arc, and drilled a cap to enable attaching copper electrodes or plates to their upper sides; these electrodes or plates being arranged to clamp the wires which constituted the fan guard ring. There were put in position on top of these movable plates or arms, pins which engaged cam levers to enable us to clamp the metal pieces firmly in position during the welding operation. There was also supplied with this equipment an electric transformer, designed to give a comparatively low voltage, and heavy amperage, which is necessary in making electric welds.

Q. 37. How were the ends of the steel wires constituting the guards brought together?

A. The wires were ordinarily bent over in the shape of a ring, so that the ends would come together with some slight amount of pressure. That is, they were formed a trifle smaller than the circle would be when completed. By placing these ends into the clamp with the abutting ends meeting between the two movable parts, or the two sets of copper electrodes, and clamping them firmly with the cam levers, then taking hold of the lower set of cam levers, turning them slightly, you applied pressure which forced the ends of the wires together.

Q. 38. Upon what did this lower set of cam levers impinge in order to give that result?

A. Upon the movable plates which carried the electrodes and clamps.

Q. 39. You were present this morning, were you not, when Mr. Gravell operated a butt welding machine here in Detroit for the information of the Court?

A. I was.

Q. 40. How did the operation of that machine that you constructed in 1901 for butt welding the fan guards correspond to that operation which you saw this morning of butt welding?

A. Practically the same.

Q. 41. What success did you have in electrically welding the ends of the steel guard wires in this steel bladed fan in 1901?

A. I had perfect success.

Q. 42. It was a satisfactory operation?

A. Entirely so.

Q. 43. Did you test the joints for strength, and if so, how did you do it?

A. We tested the joints for strength by bending them back and forth, by hammering them out straight, making short bends in them.

Q. 44. Did you find the joints strong and serviceable?

A. The majority of the work was as strong at the welded point as it was anywhere else in the body of the stock.

Q. 45. And after you had successfully welded the ends of the guard wires on this steel-bladed fan, how came you to arrive at the conclusion you could also weld the fan blades and spiders?

A. That was the result of an effort on my part to electrically weld copper wire of a reasonable cross section, approximately the same cross section as the guard wires.

Q. 46. A little louder. What was your answer?

A. That was the result of an effort to electrically weld copper wires which were of approximately the same cross section, or diameter, as the guard wires were.

Q. 47. You mean to butt weld them?

A. Yes, sir.

Q. 48. You may go on with your illustration.

A. When I tried this operation, I was not successful in making a weld; I did not seem to get the heat necessary to fuse the projecting ends. This led me to believe I did not have sufficient resistance at the point of contact between the abutting ends of the copper wire, but I did know that this resistance was generated by heat on the iron wires; to get, therefore, practically the same effect on the two copper wires, as I did get on the two iron wires, I put pieces of sheet steel, small pieces of sheet steel, between the abutting ends of the copper wire; the copper wires were clamped in position in the jaws; small pieces of steel placed between the abutting ends; pressure applied, with the aid of the lower clamp to move the swinging plates toward each other, and turn on the current, and while I generated heat, apparently lots of it, I did not weld my copper wires, but I did weld my two steel plates.

Q. 49. How did you expect to weld the two copper wires with the steel plates interposed between them?

A. My impression was that the resistance of the steel plates would generate sufficient heat which would be communicated to the copper wires to bring them up to the fusing point, and the pres-

sure applied would force out the steel plates which would melt up, and I would have a weld.

Q. 50. You mean you expected the copper wires would pass through the steel plate after a proper degree of heat?

A. Yes, sir, after a proper degree of heat, or they would burn up or melt out the steel plates.

Q. 51. So that the ends of the copper wires would come in contact?

A. Yes, sir, the ends of the copper wires would come in contact.

Q. 52. And be sufficiently heated to weld?

A. Yes, sir.

Q. 53. Tell us again what the result of that trial was?

A. The steel plates came up to a welding heat on their two meeting surfaces, but my copper electrodes did not come up to a welding heat, when I cut the current off. Since that experiment was not successful, I found I had made a perfect weld between the two steel plates.

Q. 54. Now, how did you utilize that discovery, if at all?

A. After repeated experiments, or repeated demonstrations of the process to enable me to get a good idea of the strength of a union of that kind, it appeared to me that could be used to replace or to take the place of the rivets in the steel blade guards or centers.

Q. 55. In making these experiments on what you have referred to as plates, what was the thickness of the material?

A. The steel plates were about .035 thick, possibly more, may have been less. I did not ordinarily micrometer the stock, and the centers—

Q. 56 (interrupting). No, I am speaking now of the experiment you made before you began to do anything with the centers.

A. That is what we called our fan blade stock, just a trifle more than $1/32$ thick.

(The Court: Of the same material of which you made the steel fan blades?)

A. The same material.

Q. 57. (By Mr. Church). Now, you may go on and state what, if anything, you did in the way of making practical application of the discovery you made in your experiments?

A. I welded up a number of steel fan blades to steel centers.

Q. 58. What modification or addition, if any, to the welding machine that you had there and had used to weld steel guard wires was made to enable you to weld the fan blades to the spiders or centers?

A. I introduced into the machine electrodes of copper points which were clamped in position that the guard wires originally were clamped.

Q. 59. You mean you substituted them for the steel wires in those places?

A. Yes, Sir.

Q. 60. Then what did you do?

A. I pointed the ends slightly to concentrate the heat at the point of contact. These constituted our electrodes, as we call them now.

Recess to 1:30 P. M. same day.

AFTERNOON SESSION.

The Court convened pursuant to recess.

F. P. McBERTY resumed the stand, and his direct examination was continued as follows.

Examined by MR. CHURCH:

Q. 61. During the noon recess, you stated to me that you had made an error in regard to your employment.

A. Yes, sir.

Q. 62. If you desire to correct anything, will you please do so?

A. I made the statement I had been employed by the Warren Electric and Specialty Company until the time I left that place in 1906. I was employed by the Warren Electric and Specialty Company until the Peerless was organized, and then I was employed by the Peerless, and discontinued my connection with the Warren Company, and that was in 1902.

Q. 63. So that up to 1902, you were employed by the Warren Electric and Specialty Company, and thereafter by the Peerless Company; is that correct?

A. That is correct.

Q. 64. Is that original welding machine that you used to weld the ends of the steel guard wires and the blades and spiders of the steel-bladed fan still in existence? If so, please state where it is at this moment.

A. It is in existence at the plant of the Henry Ford Motor Company, Detroit.

Q. 65. Is it accessible, so that the Court can view it, if, later on, he takes a recess for that purpose?

A. It is, and ready for operation.

Q. 66. Please examine the photographs I now show you, marked respectively Defendant's Exhibits C and D, and Defendant's Exhibit E, offered in connection with the deposition of defendant's witness, Captain W. E. Smith, and state, if you know, what they represent?

A. Exhibit E represents the front view of the transformer or welding machine.

(The Court: The one of which we have been talking?)

(Mr. Church: Yes, Your Honor.)

(The Witness: That is correct.)

Q. 67. Exhibit C?

A. Exhibit C is the top view or plan view of the welder as it appears at present; it shows the welder with the pair of electrodes in position, and the fan between the electrodes. Exhibit D is another view, practically the same thing, giving the same detailed view of the entire machine; the blades are shown between the electrodes and the transformer and the support. I will say here that is not the original frame upon which this welding machine was attached.

(The Court: The wooden part?)

(The Witness: The wooden part. It was of the same general shape when we used it in 1900 and 1901.)

Q. 68. (By Mr. Church) What was the machine attached to in 1901?

A. It was attached directly to a heavy bench, which was used for the manufacture of fan guards.

Q. 69. Where was that?

A. That was on the second floor of the fan motor department of the Warren Electric and Specialty Company.

Q. 70. Please examine this additional photograph I show you, and state, if you know, what that represents?

A. This represents the top or plan view of the same machine, with conductors conducting the current through the welding clamp, the jaws disconnected to illustrate how these lower jaws were attached when the machine was used for welding.

(Mr. Church: Defendant offers in evidence the photograph last shown the witness, and requests the same be marked Defendant's Exhibit G.)

Q. 71. When and for what purpose were these photographs, that you have referred to, taken?

A. These were taken in 1917 to illustrate the general design of the machine and to give a fair idea what the position of the machine was as we operated it in 1901.

Q. 72. Utilizing these photographs, please point out the various parts of the machine shown in them, and then explain how the machine was operated to weld the steel blades, and centers about which you have been testifying.

A. Well, on Exhibit C the machine is shown with a front or

plan view. The electrodes which carry the requisite amperage and low voltage to the welding jaws are shown, and this illustration here shows the copper electrodes in position and also a fan blade and center in position, and one arm of the spider is shown. These are copper jaws and they are so made to promote movement here. These are copper jaws here, and these are copper conductors, leading from the transformers; and short copper rods to form the electrodes; these copper rods are pointed to concentrate the energy on a comparatively small area. Exhibit D is practically the same thing, only it shows the operator's hands in position when they are welding blades to the fan. In Exhibit G you have here in the first place the angle shaped pieces which constitute the bed plate of the machine. Here is the insulation which is put in to keep the currents apart. These parts illustrate the metal plates which carry the copper electrodes. This is one of the copper electrodes and this is the other. These are movable electrodes in both cases. These two top cams here are so designed as to force the copper electrodes against the wire which is inserted between the jaws here; they are copper electrodes for spot welding the wire or iron for butt welding. And these cams, lower cams, slightly shorter, are designed in the same way, so that by rotating around the pins, they force these two movable sections together. Now, the only difference between this machine and the butt welder we saw this morning is the one we saw this morning is adapted to move in a straight line, and this is an arc, but comparatively little, not more than $\frac{1}{4}$ of an inch all told. But when you turn these handles around, that forces these pieces together with considerable force, and these pieces here, which are copper, constitute the main conductors, giving here a good contact on these copper points, permitting the current to flow from this point across the abutting electrode here, completing the circuit, and generating the heat at the point of contact.

Q. 73. At the expense of repetition, I wish you would tell the Court precisely how you proceeded with this machine to weld the guard wires, for the moment leaving out of consideration the blades.

A. I will place that so you are the operator. (Referring to photograph Exhibit G) You are the operator. The guard wire is laid on here; these rings are approximately $17\frac{7}{8}$ inches in diameter, so that they lead around back of this bench, just clearing the bench; they are dropped in position. These handles are out here this way, giving room to drop the ring in position. With the device for welding round rods, this is slightly curved, to correspond to the curve of the ring. This is dropped in position with the ends together, although with not much pressure. The upper clamps are brought directly towards the operator, which forces with pressure, forces the copper point firmly against that piece. That is the main electrode. With the die lug in position, you then turn the lower clamps which operate the swinging supports. This

forces the ends together. Then the operator presses down his foot switch which is shown on Exhibit D. This has not been mentioned before, but it was the device for turning the current on the transformer when they are ready to weld. This foot switch device is necessary in this particular type for the operator has to use both hands in controlling the pressure. When his ends are firmly clamped, he presses down this foot switch, which causes the current to flow. It is an alternating current and flows through these electrodes, the point of contact being defective, the contact generates the heat at that point, which brings it up to a welding point. As soon as it gets to the welding point, which is judged of by the operator, he forces the ends of the lower cams together; the metal flows or squeezes together, and the weld is completed. He cuts off the current, the upper cams release the ring and slip it out and the weld is completed.

Q. 74. Will you please, in like manner, go through the process of welding those blades to the spider taking care in your description to refer to the parts in a way which will show which part you are referring to.

A. In welding the blades to the spider, you will again consider yourself the operator. We place our copper electrodes in the same identical position that we did our guard rings with the ends a slight distance apart.

(The Court: You supplement the original copper electrodes with pieces, which changes the method of application?)

The Witness: The copper electrodes merely change the method of application of the current; that is all. In other words, it takes the place of copper points for butt welding. With these copper electrodes, or welding points, as we call them, now in position, we clamp them firmly with the aid of the upper two cams and turn the lower cams or pressure cams back towards the operator, permitting the jaws to spread apart, as they are adjustable, and we then hold our fan blades in the center and in the proper relative position to each other, slipping them down on those two points, copper electrodes; holding that with one hand, we turn one lever out, which brings this electrode back; we then turn our second lower lever out, which brings the contact or electrode firmly against the blade on one side, and to the center on the other. When we have secured contact there, we again apply pressure to the foot switch, which causes the current to flow, and the current flows through these pointed electrodes, through the two pieces of sheet steel or fan center and the fan blade to the opposing electrode, and the metal, the steel, which is of greater resistance and a poorer conductor, generates sufficient heat to bring it up to the welding point. When the operator has the proper temperature, which is judged by the eye, he presses this

down, releases this lever, which permits the jaws to swing or spread apart, and your weld is completed. You repeat the operation for each individual weld.

Q. 75. Will you please examine the set of fan blades I now show you and state what it represents and when it was made.

A. This represents the steel fan center and four steel blades of the standard type, which is manufactured at the present time by the Peerless Electric Company, as far as the center is concerned, but not the blades. They have discontinued manufacturing this form of blade in this shop. This fan blade was welded to this center the latter part of last week by myself.

Q. 76. On what machine?

A. On the old original welder, manufactured in 1901.

Q. 77. You do not claim then this particular set of fan blades and spider was manufactured at an early date?

A. Oh, no, but simply for the purpose of illustration in this case, although it is a very fair representation of the product at this time.

Q. 78. State whether or not this was welded by the machine as shown in the photograph?

A. This was welded on the machine represented in the photograph, which we built in 1901 in the Warren Electric & Specialty Company's shop.

(Mr. Church: The fan blade and spider produced by the witness is offered in evidence as Defendant's Exhibit H.)

Q. 79. In the use of this original machine of yours in 1901, at how many points was each steel blade welded to its respective steel spider?

A. In three points on each blade.

Q. 80. State whether or not the places or spots at which the blades and spider arm are welded together were surrounded by unwelded portions or metal parts?

A. They were.

Q. 81. How far apart were these welds, and how far from the edges of the blades and spider?

A. Without measuring, it would be difficult to say, but the spot welds were placed in the center of the blades, and in the center of the spider, the points of contact, as nearly as we could get it with the eye.

Q. 82. How far was that from the edges?

A. I should say at least one-eighth of an inch at the narrowest point.

Q. 83. State whether or not the welds that united the blades and spider arms answered the purpose of rivets?

A. They did in every respect.

Q. 84. What have you to say as to the strength of the union between the blades and spider arms at the places or spots of welding? Of course, we are now referring to 1901.

A. I would say the strength was much greater than the rivets; in other words, it would tear out a piece of metal before the weld would let go.

Q. 85. Did you, in 1901, make any tests to determine the strength of the welds, and, if so, what did you do, and what was the result?

A. I did that repeatedly, and in these tests we would either destroy the blade, destroy the center, or both, and very seldom the welds did not tear out the sheet metal, rather than let go between the two contacting places.

Q. 86. State whether or not these tests were satisfactory to you, indicating the good character of the welded union between the blades and spider arms on these steel-bladed fans?

A. These tests were entirely satisfactory, as far as any one had observed them at the time.

Q. 87. Now, Mr. McBerty, state whether or not any of these steel-bladed fans were made up by you for the market in 1901?

A. There were, quite a few of them.

Q. 88. What do you mean by quite a few; that is very indefinite?

A. When I say quite a few, I mean there were 15 or 16 all told of the one type, spot welded. We sent these fan blades through the factory in trays which were arranged to hold a certain specified number of blades, and one tray of these went through the course of manufacture.

(The Court: Were they put into commercial use?)

A. Yes, sir.

Q. 89. Will you please state just how the steel-bladed fans were tested and prepared for the market?

A. I think I can better illustrate that by taking this blade here, if that is satisfactory (referring to Defendant's Exhibit H). This steel center is put in position of the blades and clamped there with electrodes—well, in three points—after the blades are assembled on the center, they are sent to the manufacturing or machining department and are mounted on steel hubs which has a small projection or collar, this hub being bored to fit the armature shaft of the fan. It is then mounted in a punch press, which firmly punches the steel center attached to this steel hub. It then goes back to the operator, who takes the steel blade mounted on his steel hub and slips it on a mandrel which is ground true, and sets it on a device arranged to rotate the whole in proper position. He rotates that between two adjusting points or distance points, the idea being to cause this corner to touch one distance point and then touch the other, which gives what we call the pitch of the blade. The four blades are supposed to turn in the same circle, being practically the same distance from a given straight line. After the proper pitch is put in the blades, it goes to a second operator, who puts it on another mandrel and is laid on what we call the balancing machine,

this mandrel being six or eight inches in length. They are permitted to rotate until this heavy material is balanced, and it is then clamped and allowed to rotate and adjusted until this blade can be set at any point and it will stand stationary and then the balance is completed. The blade then has the proper pitch, has the proper balance, and it is completed as far as the operation is now concerned. It is then put into the painting or japanning department, where it receives a coat of japan, one or three coats, whatever they wish to put on. After it has been properly japanned, it is returned to our stock room, that is where all the various parts meet in the factory. It comes back in the tray which holds a number of them, and stays there until the tester or inspector calls for it. He ordinarily takes these blades out and mounts them on a fan or sets them on what he calls the testing block and turns the current on at various speeds to see whether they run smoothly. If properly balanced, it runs smooth and makes no noise. If found perfect, he turns them over to the shipping department.

Q. 90. State whether or not the process of testing which you have elaborated was used in the testing of that batch of blades and fans made in 1901, about which you have testified?

A. This process was applied to the regular spot welded blades and went through identically as it was with the riveted blades; they went through the same course of handling and finally was disposed of in the same way as riveted blades were disposed of, went out as the regularly manufactured article.

Q. 91. State whether or not the production of the steel-bladed, spot-welded fans of 1901 was regarded as a realization of the direction given you to produce a cheap or moderately cheap fan?

A. That was regarded as a development along the line suggested, that we produce a fan that was as much cheaper than our regular or high grade fan as could possibly be made. It eliminated punching, and eliminated the use of rivets.

Q. 92. State what, if anything, was done in the way of offering these steel-bladed, spot-welded fans on the market in 1901?

A. The most striking point was that our sample fan which is always one of the first of a given type that is brought out, was equipped with spot-welded blades and photographed, and cuts were made for the catalog from that photograph, and illustrated in our regular catalog covering that year's production of these spot-welded blades. One of the first we produced was so used on the small fan, the fan was photographed, the cut was made, and the fan blade was advertised, or the fan was advertised complete with that type of blade.

Q. 93. I show you a pamphlet and ask you to state what it represents, and when you first saw it, or one like it.

A. This represents the Warren Electric & Specialty Company's fan catalog of the season of 1901, and I cannot exactly identify the date it was put out, or when I first saw it, but it was some time along—that is as I first saw it with reference to this particular fan,

but this particular catalog was brought to my attention in 1917 at the office of the Peerless Electric Company at Warren, Ohio.

Q. 94. Can you point out in this catalog of 1901 any cut or description identifying the steel-bladed, spot-welded fan of 1901, about which you have been testifying? If so, please do so and show it to the Court.

A. I can. This 1901 type of fan was classified as all our fans were classified by a letter to indicate the type of fan it was. Our high grade fan originally started out by being classified as Type A. Later, we developed what is known as a cast iron fan, which was designated as Type E, and this type here was designated as Type G, and we have a cut of the Type G fan indicated here as the G-2 on page 17 of this 1901 catalog.

Q. 95. Please examine the various cuts of fans shown in the 1901 catalog and tell the Court if you find anything indicating how the fan blades and spider arms of those fans were united?

A. On the G-1 fan you will note by looking carefully there are rivets in that blade, and on the E-4 you can see the rivets. On E-3 you can see the rivets. On G-2 you do not see any rivets.

Q. 96. From what, if you know, were those cuts made?

A. Those are taken directly from photographs of the particular fans produced for any given season.

Q. 97. Why do you not find any rivets on fan lettered G-2?

A. Fan G-2 is an illustration of the fan that was produced by the spot-welded blades, and consequently no rivets shown.

Q. 98. Do all the other fans in that catalog show rivets?

A. Every other fan in the catalog shows rivets.

Q. 99. Do you find any descriptive text in this 1901 catalog, indicating how the blades of any of those fans were secured?

A. Referring to our Type A, direct current desk fan, on page 8, under the paragraph headed "Blades":

"Blades are of best quality of heavy spring brass, firmly riveted to solid cast brass center, with hub of ample length to insure firm bearing on shaft. Every blade is carefully adjusted and balanced to run at a high rate of speed without vibration."

That refers to the Type "A" fan, the best grade of fan produced at that time. On Type "E" fan they do not go into details so much, but they do say that:

"Type 'E' fan is of extra strong mechanical construction, and its use is recommended where hard usage and little attention are inevitable. Body of fan is heavily enameled in black, hand polished and striped with gold. All brass parts are highly polished and lacquered.

"General construction of blades, guard, armature, commutator, bearings, oiling device and regulating device is the

same as in Type A fans. Brush holders are of the cartridge type and easily removed.

"We recommend this fan to those desiring a universally adjustable fan."

On page 17, under the heading "Type 'G' Direct Current Desk Fans," it says:

"Types (G-1) and (G-2) are rigid iron clad fans of symmetrical design and strong mechanical construction. The finish throughout is plain black enamel. This fan develops a large wind output, but is less efficient than Types A or E, illustrated on preceding pages. We recommend this fan to those with whom efficiency is a secondary consideration, but who desire a strongly built, serviceable fan at low first cost. This fan operates at one speed only."

Q. 100. In what respects would you say those G-2 fans illustrated in the catalog were of cheaper grade than the other fans?

A. They were constructed with as little finish as we could possibly get away with; the idea being to cut the finish, which is one of the expensive operations in producing fans. The result was we assembled them and gave them a dip of black japan, simply applying the japan to the body. We put no gold stripe on, and finally we cut out the resistance or speed variation device, making it merely a one-speed, and turning the switch on you have the full current, full speed.

Q. 101. How as to qualities of adjustability?

A. It had no adjustments to permit rotating on the base, or any device to permit it to be tilted forward or back, all these extra operations being eliminated.

Q. 102. What was the material of the blades and spiders of that type of G-2 fan?

A. The blades and spiders were of iron or steel, rolled steel.

Q. 103. How many of those fans of the G-2 type illustrated in the 1901 catalog do you understand were actually made?

A. Referring to the G-2 fans or blades, there were 15 or 16 of that type of blade gotten out.

Q. 104. And that was when, what year?

A. That was in the early spring of 1901.

Q. 105. Do you know what became of those fans of the type shown in the cut G-2 of the catalog of 1901?

A. I do not know what became of them, further than the fact they were taken from the stock room and assembled on the fan and went through with the fan wherever it was shipped.

Q. 106. You have stated that a quantity of these steel-bladed, electrically spot-welded fans were made up and sold as the regular product during the fan season of 1901. When were the fans disposed of that were constructed like this G-2 fan you have testified about?

A. They were disposed of during the fan season of 1901 and 1902. I am not in position to say definitely in which year those parts went forward with the fans. They went with the stock, or possibly on a direct order.

(Mr. Stackpole: How can he testify to anything of that sort? I would like to have him confine himself to what he knows himself.)

(The Court: This last statement was speculation, of course.)

(Mr. Church: Very well.)

Q. 107. Why, if you know, were not more of this type of fan with the spot-welded blades and spiders put out?

A. That was a matter that was discussed between D. W. Gilmer, the general manager of the Warren Electric & Specialty Company; Mr. Jasper Powers, the production man, or machine shop superintendent, of the Warren Electric & Specialty Company, and myself. We had to get out a certain number of fans in a given time. We got our sample fan completed, and the matter of spot welding the blades was taken up with Mr. Gilmer and with Mr. Powers, Powers being the mechanical man, having in charge the production of the metal parts of the fan, and he rather insisted that we stick to the older method of riveting, due to the fact he had the punches made for punching his centers, and punching his blades. He had operators skilled in putting these blades in position, and could go through all the regular processes without any interference at all, it was standard, whereas, if they had to be spot welded, it meant an electric welding machine with capacity enough to take care of our current for welding both the blades and spiders and required considerable time, particularly if we got what we call a hot season, and be compelled to produce a lot of fans, and again, he would have to purchase jigs for holding the blades in position, and also another welding machine, to give us capacity to take care of the product. All those would involve an outlay of considerable money, which was quite an object with us, and the delay, due to the production of the additional machine jigs, and furthermore, it would compel us to carry a line of fan blades which were punched ready for the brass rivets, a line of centers already punched and a line of blades not punched, and a line of centers not punched, thus compelling us to carry duplicate stock, which we always avoid if we can. The final result was they overruled my spot-welding idea, sticking to the riveting for that season, with the definite understanding if anybody wanted spot-welded blades we would be in a position to weld them.

(Mr. Stackpole: What was the definite or indefinite understanding is not competent.)

(The Witness: That was definite.)

Q. 108. Notwithstanding this determination of the superintendent, Mr. Gilmer, not to stock up with the steel fan blades for this G-2 fan, did the Warren Electric & Specialty Company still continue to advertise them and offer them for sale?

A. They did.

Q. 109. I show you a catalog and ask you to state what it is and when it was put out, and by what concern it was put out.

A. This is the Warren Electric & Specialty Company, or Peerless Direct Current Fans for the season of 1902, and I might remark right here that we issued one catalog per year, and this was brought out sufficiently early to get it in the hands of the jobbers before the fan season started.

Q. 110. Will you point out to the Court, if you can, any illustrations in that catalog of this steel-bladed, spot-welded fan?

A. This same steel-bladed, spot-welded fan is illustrated on page 11 of the 1902 catalog.

(The Court: That is exactly the same illustration as in the 1901 catalog?)

A. Exactly the same; we offered the same type of fan, as far as the illustration is concerned.

Q. 111. Do you find anything in this 1902 catalog indicating the method by which the blades of that G-2 fan were applied?

A. No, there is nothing said in reference to it directly, but the illustration shows a blade without rivets.

Q. 112. How are the other fans illustrated in that 1902 catalog shown as to method of attaching the blades to the spiders?

A. Every other fan shown in this catalog has riveted blades, and the rivets distinctly show.

Q. 113. Is there anything in the text of that 1902 catalog relative to G-2 type of fan that is different from the text or description found in the 1901 catalog? If so, please point it out to the Court.

A. There is a slight change in the description of this G type of fan, and that is due to the finishing. Our first season's output of fans did not sell as readily as we anticipated.

Q. 114. You mean 1901?

A. Yes, sir. It says:

"Types G-1 and G-2 are similar to types E-1 and E-2, except they are not adjustable and no attempt at ornamentation has been made on this fan, the finish being black without stripping for base and body, and with nickel plated guard and blades. It has three speeds and is strong and well built and perfect electrically."

Instead of supplying a black japan finish over the entire fan,

they have changed the finish from black japan to nickel plate, as far as the guards and the blades are concerned, and they added these variations on the standard of the other fan.

Q. 115. In the fan of that 1902 catalog, is there anything indicating how in the case of the fan that employed brass blades and brass guards the guard rings were united?

A. The guard rings were not butt welded.

Q. 116. Refer to the catalog and see if any reference is made to them.

A. The brass guard rings are not illustrated as being butt welded at any time, because we could not butt weld them.

Q. 117. How are they illustrated as being connected or fastened?

A. On the front ring of the G-2 fan you will note a sleeve put in position there. That is one method of fastening the rear ring. This one here is comparatively thin. The same thing applies to the other guard as far as the brass finish is concerned.

Q. 118. Referring to the G-2 fan shown in that catalog of 1902, is there anything indicating how the guard wires were fastened?

A. There are no marks of any kind indicating how they are fastened. They are practically a complete circle, no joint, which is due to the electric welding process.

Q. 119. Is that true of the type shown in the 1901 catalog?

A. That is identical with the 1901 catalog.

(Mr. Church: I offer the 1902 catalog in evidence, to be Marked Defendant's Exhibit I, 1902 catalog.)

(The Court: Have you put in the 1901 catalog?)

(Mr. Church: That was put in in the deposition of Captain Smith.)

Q. 120. Evidence has already been offered in this case to the effect that in 1902 the Warren Electric & Specialty Company sold its fan department to the Peerless Electric Company of Warren, Ohio, and that the latter company carried on the former company's fan business under a new name. Please examine the pamphlet I now show you and state if you know what it is.

A. This pamphlet handed to me is the Peerless Electric Company's fan catalog for the year 1903.

Q. 121. What is the marking on the inside of the first page?

A. It says "Plaintiff's Exhibit No. A."

(Mr. Church: I offer that catalog in evidence as Defendant's Exhibit No. J, Peerless catalog 1903.)

Q. 122. Do you find a G fan illustrated in this 1903 catalog? If so, state how it compares with the G-2 fan of the catalogs of 1901 and 1902.

A. I do find on page 5 of the catalog the G-2 fan, and it does not compare with the G-2 fan of the 1901 and 1902 catalogs.

Q. 123. What is the difference?

A. This G-2 fan illustrated here has riveted blades; it has the support for the fan body known as the trunnion, and also has what we call the swivel base, and the three-speed arrangement in the base of the fan.

Q. 124. How about the blades?

A. The blades are shown as riveted in position.

Q. 125. What does that indicate to you as to the method by which the fan is put together?

A. This fan is riveted in the same manner as the regular fans were, that is, the same manner as our high grade fans were. These metal blades are riveted to the metal center.

Q. 126. Do you find in that 1903 catalog any illustration of a fan in which the fan blades are not riveted; plainly indicated as such?

A. No, there is no fan illustrated in this 1903 catalog that does not show distinctly rivets.

Q. 127. Is there any illustration in that 1903 catalog of steel-bladed, spot-welded fans?

A. The spot-welded, no; the steel blades, but not spot-welded, riveted.

Q. 128. Am I right in saying that the 1901, 1902 and 1903 catalogs all show and describe brass bladed fans as riveted, while the 1901 and 1902 catalogs show steel bladed fans with no indication that they were riveted?

A. You are right in that statement. It particularly mentions the fact on page 2 that the direct current desk fans, the blades are firmly riveted to their centers.

Q. 129. I show you another pamphlet and ask you to state, if you know, what it is, and by whom it was put out?

A. This also is a Peerless Electric Company's fan catalog for the year 1904.

Q. 130. Is there any steel-bladed, spot-welded fan illustrated in that catalog?

A. There is not.

Q. 131. How are the fan blades of the fans illustrated as connected to their spiders in that catalog of 1904?

A. Every illustration in this catalog of the desk fans shows rivets in the blades.

Q. 132. Have you in your possession or under your control any of those steel-bladed, spot-welded fans that were made in 1901, put out on the market, as you have testified?

A. We have not. I have not.

Q. 133. Have you made any effort to locate any of those fans, and if so, state with what success.

A. I have made an effort to pay if we could locate any of the

spot welded fan blades produced in 1901, and we haven't been successful in locating any.

Q. 134. State a little more specifically what has been done to locate one of those fans, giving the Court an idea of how diligently you have been trying to find one.

A. Mr. William E. Smith, Captain Smith, made quite an extended search personally among the repair shops and jobbers in the East at all points we could suggest that he might be successful in picking up a fan of this kind that had been sent in for repairs or returned for any reason whatever, but he was not successful, although he spent several weeks in this investigation. Mr. Barthel of Detroit also endeavored to find a fan of this type and has traveled around and called on a number of dealers, jobbers and repair men to see if he could secure anything of the kind.

Q. 135. Please examine the paper I show you and state if you know what it is and at whose instance it was printed.

A. At the request of Mr. Church, we issued a circular, giving an illustration of the fan illustrated in this 1901 catalog and circulated the circular, offering a reward for the production of a fan of this type with the spot welded blades.

Q. 136. What steps were taken to secure circulation of this particular circular amongst those most likely to have one in their possession?

A. We sent out quite a number of those circulars or bulletins; we took what is known as the Electrical Record, which is a periodical published in New York City by the Gates Publishing Company, No. 367, known as the list of buyers, this list being published by the Gates Publishing Company, giving the names of buyers, of firms buying electrical goods. We selected from that list names of firms that we were confident were located in the territories in which these fans would ordinarily be sent, and we sent to 207 different firms these circulars, copies of these circulars, with the idea that if there was anything of the type that was advertised, some of these various firms would possibly have one, and that we would pay for this particular form \$250—if they would send us one of those blades or one of those fans, but we haven't yet had a single answer.

Q. 137. Do I understand these people to whom you sent this circular were dealers and repair men?

A. They were dealers and repair men, our idea being that the fans would eventually come to the repair men, because fans in the course of two or three years will be returned to be smoothed up or oiled up or refinished.

(Mr. Church: One of the circulars referred to by the witness is offered in evidence as Defendant's Exhibit K, Advertising Circular.)

Q. 138. Will you state the result of these advertisements or the circulation of these circulars?

A. We were not successful in locating anything at all in the line of a spot-welded fan. In connection with this circular, you will note it says: "The Peerless Electric Company of Warren, Ohio, stand ready to pay," etc., the idea being to interest the dealers that were doing business with the Peerless Electric Company who still produced fans, and while we sent them out from the office of the Peerless Company, the reply was to be returned to the Warren Electric and Specialty Company.

Q. 139. Returning now to the electric welding machine built by you in 1901, please state who did the work on that machine?

A. The welding machine was constructed by Jasper Powers, the machine shop superintendent of the Warren Electric & Specialty Company, that is, the welding machine proper.

Q. 140. Where was the transformer that was used in connection with that machine obtained?

A. The transformer that was used in connection with that butt welding machine was obtained from the store room of the Warren Electric & Specialty Company.

Q. 141. Can you give us the history of that transformer?

A. In the spring of 1900 a firm known as the Pneumatic Wheel Company of Freehold, N. J., wrote to the Warren Electric & Specialty Company for a quotation on a welding transformer, or transformer with the proper voltage for the welding of metal rings, and this transformer was produced and shipped to them and tested out by them, but was not of sufficient capacity to preform the work for which they had purchased it. It was later on returned to the plant of the Warren Electric & Specialty Company for exchange for a much larger transformer for the identical service, and the transformer in question being in stock in the transformer department, was later on turned over to the fan motor department to operate in connection with this welding machine that we produced. I will say that appears in the deposition of Captain Smith, so it is unnecessary to pursue that further here.

Q. 142. Where was the electric power obtained from that was utilized in welding in this 1901 machine?

A. We generated our own power, the Warren Electric & Specialty Company.

Q. 143. Do you recall any one who saw you engage in spot welding on this spot welding machine in 1901?

A. That is a little difficult for me to say, whether they saw me do this identical work or not. Mr. William E. Smith, known as Captain Smith, has seen me spot weld. Mr. McDonald, known at that time as our motor tester, and Mr. E. B. Craft saw me do spot welding, whether he saw me weld these particular blades in position or not. And others saw me do spot welding. There was no secret made of this process.

Q. 144. Where was this work done? Describe to the Court where you were and where you actually spot welded these fans.

A. It was done in the fan motor department on one of the benches

used in assembling the fans, on the second floor of the fan motor building of the Warren Electric & Specialty Company.

Q. 145. Did any one else besides you, to your knowledge, use this spot welding machine for spot welding in 1901?

A. Captain William E. Smith has done spot welding on it.

Q. 146. About when?

A. About the same time I did this one.

Q. 147. What year?

A. The spring of 1901.

Q. 148. Anybody else, to your knowledge?

A. I would not want to say definitely on that as to who else.

Q. 149. Have you preserved any specimen of spot welding done on that machine in 1901?

A. I have.

(Mr. Church: Mr. Stackpole, have you in your possession the specimen of Mr. McBerty's spot welding work—)

(Mr. Stackpole: I am not sure. Mr. Church has asked us to produce a specimen said to have been made in 1901 by these people which we have in our possession. It is attached to an affidavit that we shall have occasion to use and will be used, no question about that, but we see no reason for producing it at the present time.)

(Mr. Church: I think we ought to see it now.)

(Mr. Stackpole: I should not like to detach it from the affidavit, because it is pretty important.)

(Mr. Church: I do not want to see your affidavit. You may seal up your affidavit.)

(Mr. Fish: He has not indicated whether he has any other samples or not, and it seems to me this might be postponed until we see whether that is the only alleged relic.)

(The Court: You can find that out by a question or two.)

(Mr. Fish: I think he ought to develop that more clearly.)

Q. 150. Mr. McBerty, will you please describe the specimen of the spot welding which you believe to be in the possession of the plaintiff in this case, so that we may call for it more definitely?

A. The section of the blade that the Thomson Company should have should be a section of a blade and a part of a center cut through diagonally, which should correspond to the other blade and center; they have one half and we have the other half.

(Mr. Stackpole: Let us see the half they have.)

(Mr. Church: Is there any reason why we should not have those?)

(Mr. Stackpole: It is a part of the cross-examination that would be more effective if we do not give it up to the witness.)

(The Court: You want to use it for cross-examination?)

(Mr. Fish: Surely. I should have said one word in the opening which I did not say to prepare your Honor for this issue. This patent has been sustained by the Circuit Court of Appeals of the First Circuit in a contested case after a long hard hearing. Mr. McBerty was a witness in that case. In the preparation of the defense in that case, as far back as 1913, this whole proposition was thoroughly investigated by Edwards, Sager & Wooster of New York, who were counsel for the defendant.)

(Mr. Church: If this is testimony, perhaps he should take the stand.)

(Mr. Fish: No, it is nothing in the nature of testimony; it is a fact. They got full affidavits from Mr. McBerty and all the rest of these people and never used them in the slightest degree although the trial was not for a year or so after that. When the case was finally decided by the First Circuit, the real defendant who had got these affidavits, came in and settled up; and we have those affidavits and propose to produce them. It would interfere directly with our cross-examination to have it produced at the present moment, and I also suggest, may it please the Court, that it does not come in here properly at this time; let us see what else they have got; if they can produce anything else from their scrap heap that is in this line, let us have it. We have two or three things attached to these affidavits and even to show them now in connection with the direct examination, of course, would interfere decidedly with our cross-examination. It is a very different story that is told in them.)

(The Court: You wish to cross-examine on this affidavit and confront him with that affidavit?)

(Mr. Fish: Exactly, your Honor.)

(The Court: And you propose to produce the specimen?)

(Mr. Stackpole: Absolutely, your Honor.)

(Mr. Fish: We want this whole story, but the version of 1913 we would like to have coupled with the version of 1919.)

(The Court: Have you the affidavit of this witness attached to that specimen?)

(Mr. Stackpole: Certainly we have, your Honor, and we have a certain specimen——)

(Mr. Fish: Attached to his affidavit. There is no question about that.)

(Mr. Church: Let us have that verified.)

(Mr. Fish: The affidavit will be presented to this witness.)

(Mr. Church: Then the mystery will stand until that time.)

Q. 151. Mr. McBerty, how have you to your knowledge given any affidavit to Mr. Fish or the Thomson Welding Company or the Thomson Spot Welding Company or any predecessor of the Thomson Spot Welding Company or to anybody to which you have attached a specimen of your spot welding work of 1901?

A. I have given, I think, an affidavit to Mr. Howe, if my memory serves me right, but without reference to the specimen attached, I can not say definitely, because I would want to see the specimen.

Q. 152. You don't think the specimens are attached to that affidavit?

A. It does not run in my mind so, because I want to see the specimen.

Q. 153. Mr. McBerty, have you preserved any specimen of spot welding done on that 1901 machine, in 1901, to which you have referred in your testimony?

A. I have.

Q. 154. Please examine the specimen I now show you and state to the Court what it represents, who made it, and when it was made.

A. This is a sample of electric spot welding done on the old spot welding machine, the old electrode welding machine in 1901, and consists of a part of a steel center and part of a steel blade. Do you want the information in reference to its being half——

Q. 155. No, I am not calling for that. Where did this particular specimen come from, and in whose possession has it been?

A. This specimen is a piece of the original work, and has been in a tool box of mine in my various travels since I was employed at the plant of the Warren Electric & Specialty Company in 1901.

Q. 156. Please state when that particular specimen was made with reference to the production of the fans which you said you made in 1901?

A. This is about the first satisfactory specimen that was produced of spot welding when I ventured to weld a blade to a spider in the fan.

Q. 157. Explain how this particular specimen happened to be preserved by you?

A. Well, due to the fact it was something new, something I had never done before, and when completed, indicated something of value.

Q. 158. Will you please tell the Court how the blade and spider arm of that specimen were put together?

A. They were spot welded together as described in the method of spot welding the blades to the centers.

Q. 159. Go through the process, telling the Court just exactly how it was made, and by what machine, and who made it.

A. I made the sample myself; it was spot welded in the machine with the aid of the copper electrodes clamped where the guard rings ordinarily were held, put into position, pressure applied by your two pointed electrodes, current turned on, making the complete weld. It was then moved to make the second weld, and then moved to make the third weld. We did not make any particular effort to locate those as they should be located where we are designing a special plan. This piece here is made of an old fan, which was punched for rivets, and I spot welded in that position.

(The Court: No attempt made to make a practical fan blade?)

A. No attempt made to make a practical fan blade, no. In this particular instance, the other section here adjoining was not welded at all.

Q. 160. That is, nothing was welded to it?

A. No, sir.

Q. 161. How does the work of that specimen before you compare with the spot welding that had been done on the fans which you say were made and marketed in 1901?

A. It is not quite so neat a job as we did later on, due to the fact we devoted a little more attention with reference to the spot welding in the various tests we made.

Q. 162. I notice in this exhibit sample the figures 2-15-01 stamped on the metal of the fan blade. What do these figures indicate to you, and by whom were they applied?

A. That indicates the date at which this sample was completed, and put in my tool box.

Q. 163. What does the 2-15-01 mean?

A. That means February 15th, 1901.

Q. 164. Who stamped those figures on there?

A. I stamped those on there myself.

Q. 165. With what did you stamp them on?

A. An ordinary steel stamp, such as you find in all machine shops.

(The Court: When did you do it?)

A. When I produced the sample, I would say at the date indicated; there would be no reason for stamping another date on there.

Q. 166. I also notice on the same blade is stamped the name F. McBerty. When was that done and by whom applied?

A. F. McBerty; and it has been applied by myself.

Q. 167. When?

A. At the same time.

Q. 168. What means were employed by you to stamp the 2-15-01 on there?

A. I have already answered that question.

Q. 169. Can you produce those punches or whatever means were employed for making that date?

A. I can not produce the punches for making the date, those were shop articles.

Q. 170. What means were employed for marking F. McBerty on that?

A. My own personal stamp.

Q. 171. Where did you get that stamp?

A. That has been in my possession ever since I started to learn my trade in 1888.

Q. 172. What use have you made of it?

A. I use it for marking tools, metal tools, machinists' tools.

Q. 173. Is that name stamp here in your possession?

A. It is.

Q. 174. Please examine the stamp I now show you and state if you know what it is.

A. (Examining.) That is the name stamp mentioned.

Q. 175. Read what it says.

A. It says: "F. McBerty."

(Mr. Church: The stamp referred to by the witness is offered in evidence as Defendant's Exhibit L.)

(Defendant offers in evidence the sample specimen showing single fan blade and a portion of a fan center or spider, and asks that the same be marked Defendant's Exhibit M.)

Q. 176. I notice that the spider arm of this specimen, Defendant's Exhibit M, to which the blade is spot welded, is perforated in two places. Explain how that happens to be so.

A. The spider arm, that is a part of our standard production of steel spiders.

Q. 177. What are those perforations in there for?

A. To take the rivets for attaching the blade.

Q. 178. I also notice the blade of this specimen likewise appears to be perforated at two places. Will you also please explain how this happens to be so?

A. This is an old steel blade that has been punched for rivets.

Q. 179. I notice the spider part of this specimen appears to be

cut from another part; state if you know what has become of the other part?

A. The other portion of this center and the attached section of blade was turned over to J. Nota McGill, who was formerly attorney for the National Electric Welder Company, being given to Mr. McGill in 1912, and if I can have the time, there is some little information in connection with that that I would like to put in here, and I have some dates to refer to (referring to memorandum).

Q. 180. You may give the circumstances; if it will aid you, refer to your dates. I understand your claim is that the missing part is now in the custody of the plaintiff. Is that correct? You think so?

A. Yes, sir, it is supposed to be; yes, sir.

Q. 181. I will ask you to explain why you suppose that is in the possession of the plaintiff; state the circumstances leading up to your belief.

A. That is something, as I say, that will require some explanation, and I have noted down some dates and references which will bring the thing along up in regular order.

(Mr. Fish: We admit we have samples in our custody, not this particular sample.)

(Mr. Church: Go on and make your explanation.)

A. The National Electric Welder Company was organized in 1911 to manufacture electric welding machines, both spot and butt welding machines; and other concerns had been doing that line of business, and notably the Winfield Electric Welding Company of Warren, Ohio; the Toledo Electric Welder Company of Cincinnati, both of whom were making spot welding machines at that time. And after we got started, I was advised they had been threatened by suit brought by the Thomson Company or would be brought by the Thomson Company.

Q. 182. What Thomson Company?

A. The Thomson Electric Welder Company, predecessor of the plaintiff in this particular case, if I am not mistaken, under the Rietzel patent of July 20, 1909. I understand that patent was granted at that time; on December 19, 1912, the National Electric Welder Company of Warren, Ohio, were notified by the Thomson Company of the alleged infringement of the Rietzel patent as well as the Harmatta patent, which had been allowed December 3, 1912; I think I am getting the dates right. The patent attorney of the National Electric Welder Company at that time was J. Nota McGill, and when we received this notice of infringement we sent word—

(The Court: You say "we"; were you working for the National Electric Welder Company?)

A. No, I was a member of the National Electric Welder Company; in fact, I owned a portion of it; I am a partner and stockholder. I desired to have Mr. McGill take this matter in hand. Mr. McGill was consulted, and we told him at that time of the manufacture and sale of these spot welded fans and also of the samples I had in my tool box at the time. I wanted to protect our company; it was not a large company; we hadn't any large amount of money, and we didn't want to get involved in any litigation, and I thought possibly with the showing of evidence we had we could make some arrangement whereby we would be permitted to go on, so that we would not be financial losers in the long run, if Mr. McGill could so handle this affair and help us. Mr. McGill came to the plant of the National Electric Welder Company of Warren. I can not give you the exact date, but along in the early months of 1912, and looked over the welding machine, looked over our sample, and the question was raised of what would occur if we permitted the sample to get out of our hands; if with our sample gone, we had nothing to identify our work with that, and the suggestion was made they cut the sample in two, retain the identified section, permit the other section to be handled by Mr. McGill and see what he could do, merely taking this as a specimen of what we had done to back up the statement of the fact that we were new in the field, and at Mr. McGill's suggestion, the sample was cut——

(Mr. Fish: Unless this is leading up to something, we shall object to it.)

(The Court: I understood you consented to the explanation.)

(The Witness (continuing): Mr. McGill did not take this sample with him, as he had other business there in the valley, but we sent it to him, and I think I have the exact date on my slip here. I have in my possession a copy of my letter to Mr. McGill, dated February 1st, 1913, transmitting the sample to him by parcel post, and Mr. McGill's letter acknowledging the receipt of that sample was dated February 3, 1913, and we also have Mr. McGill's letter of September 5, 1913, stating he had delivered the specimen as requested to the firm of Edwards, Sager & Wooster, I think that is the name.)

Q. 183. Who are they?

A. They were the attorneys for the Toledo Electric Welder Company at that time and they were defending a suit which had been brought against the Barney Berry Company in Boston for infringement of the Harmatta patent. The Barney Berry Company were manufacturing skates and were using this welder, and the Toledo Company were manufacturing welders, and they were defending the suit with the assistance of Edwards, Sager & Wooster. I also

have a copy of my letter to Mr. Edwards, dated January 20, 1917, requesting the return of the blade and the letter from Edwards of Edwards, Sager & Wooster, addressed to the National Electric Welder Company, dated February 10th, 1917, stating that the Thomson Spot Welder Company had bought out the Toledo Company of Cincinnati, the Toledo Electric Welder Company, and the fan blade had been turned over to them and was now their property, as part of the proceeds of the sale, I suppose. The result was we never received our sample back.

(The Court: In that process, in the course of that work, did you make an affidavit for Mr. McGill or anybody?)

(The Witness: I made no affidavit to my knowledge to Mr. McGill, but Edwards, Sager & Wooster had Mr. Howe come out to Warren, Ohio, in 1913, if my memory serves me correctly, although I have no copy of any of those affidavits, yet we gathered up some information regarding the prior use of spot welding, and I can not say what sample he had or whether he had any sample with him or not.

(The Court: You did make an affidavit for him?)

(The Witness: I am under the impression I did make an affidavit for him along those lines. That, I think, is all I have to say along that line.)

Q. 184. Returning again to the steel fan blades and steel spiders that were spot welded in these two fans of 1900 and 1901, state whether or not the spider arms of those fans were perforated?

A. The spider arms of those fans were perforated.

Q. 185. State whether or not the blades of those fans were perforated?

A. The blades were not perforated.

Q. 186. How did it happen the spiders were perforated, while the blades to which they were spot welded were not?

A. They were simply standard stock, taken as they came from the stock room, and the perforations in the center would not materially affect the appearance, as it was in the rear of it where it could not be seen.

(Mr. Fish: Did you say the spiders were not perforated?)

A. They were perforated. The fan blades were not perforated, but the spiders were.

(Mr. Fish: That is, they were not taken from the stock that went through the factory?)

A. I will not say they were taken from the stock, the spiders were.

Q. 187. How about the fan blades?

A. The fan blades were punched and not perforated for rivets.

(Mr. Stackpole: The fan blades were punched, and not perforated?)

A. Yes, sir; when I say punched I mean blanked, but not perforated for rivets.

Q. 188. (By Mr. Church.) When the Warren Electric & Specialty Company were manufacturing these electric fans, under what name did they sell them, trade name?

A. Sold as the Peerless fans.

Q. 189. The Peerless fans?

A. Yes, sir.

Q. 190. State whether or not the Peerless Electric Company was formed after the manufacture and sale of the so-called Peerless fan by the Warren Electric & Specialty Company?

A. Yes, sir; the Peerless Electric Company was organized some three or four years after the Peerless fans had been placed on the market.

Q. 191. And the name Peerless was retained as the trade name for the fans, although they were not put out by the Warren Electric & Specialty Company, but by the Peerless Electric Company; is that correct?

A. That is right.

Q. 192. When the fan department of the Warren Electric & Specialty Company was sold and transferred to the Peerless Electric Company, what became of the welding machine you have been interrogated about, and what about the stock that was then on hand?

A. The old welding machine went along with the rest of the fan equipment of the Warren Electric & Specialty Company, together with all the fans they had in stock and parts.

Q. 193. To your knowledge, was the welding machine used by the Peerless Company for any purpose? If so, for what purpose?

A. The welding machine was continued in use on the steel fan guards in 1906, at which time I discontinued my connection with the Peerless Company, although the machine was continued in active service for about four years longer.

(Mr. Stackpole: Have you any personal knowledge of that fact?)

(The Court: Have you personal knowledge of that?)

(The Witness: I know from hearsay and from the superintendent of that department.)

Q. 194. (By Mr. Church): After the Peerless Company got

this welding machine, state whether or not to your knowledge it was used for spot welding fan blades?

A. Not to my knowledge.

(The Court: This was a homemade machine, was it?)

(The Witness: Strictly.)

(The Court: Who made it?)

A. Made in our own shop by Mr. Power.

(The Court: What did you have to do with it?)

A. I designed the thing, sketched it out.

Q. 195. (By Mr. Church): Did you at any time, Mr. McBerty, attempt to patent the process of spot welding as practiced by that machine in 1901 for the spot welding of blades to the center?

A. I did not.

Q. 196. Did you at any time consider the application of electric welding as a patentable subject?

(Mr. Stackpole: That is objected to, as he is not qualified to answer the question.)

(The Court: The objection is sustained.)

Q. 197. (By Mr. Church). At all events, you made no attempt to patent it?

A. I did not.

Q. 198. When to your knowledge was a spot welding machine for welding flat plain surfaced plates together by pressure and current applied to one or more electrodes first put upon the market?

A. I would say that line of product was first put upon the market along about 1908. It is rather difficult for me to say.

Q. 199. What machines first appeared on the market for doing this spot welding, so-called, and who put them out?

A. The Winfield Company manufactured the first spot welding machine that I knew.

Q. 200. When was that?

A. That was along about that time, 1908.

Q. 201. What other concerns were making spot welding machines and when?

A. The Toledo Electric Company came into the business very close to the same time, 1908 or 1909.

Q. 202. Any others?

A. Later on there was the Agnew Electric Company, I think that was the name; the Detroit Electric Welder Company, and the National Electric Welder Company about 1911.

Q. 203. Did the Universal Electric Welding Company put out a spot welder before the National Company put out one?

A. Yes, sir, they did. That is, they advertised a spot welder.

Q. 204. I show you a catalog. Will you please state what it is and about when it was put out, if you know.

A. This is a catalog of the Toledo Electric Welder Company, located at Northside, Cincinnati, Ohio, issued, according to the stamp on it, in April, 1912.

Q. 205. Does that show a spot welder? If so, give the page.

A. On the outside cover page is shown a power-driven spot welder.

(Mr. Church: Defendant offers the catalog in evidence as Defendant's Exhibit No. N.)

(Mr. Stackpole: This catalog is incomplete; there has been something cut out and it may be quite material. There are some of these catalogs in the other case, and there was a good deal of material matter in it——)

(Mr. Church: That is the only one I have.)

(The Court: You may reserve your objection and see.)

Q. 206. Please examine the catalog I now show you, and state what it is?

A. This is a catalog for electric welding machines for point, ridge and spot welding, issued by the Universal Electric Welding Company.

Q. 206. Is there anything in that catalog indicating the time it was issued?

A. The most prominent date on this catalog is the rubber stamp on the outside: "Removal, November 1, 1912, to Crystal Building, 47-48-49 West Street, New York."

Q. 207. You can testify, can you not, that at least as early as November 1st, 1912, the Universal Electric Welding Co. was putting out a spot welding machine?

A. Yes, sir.

(Mr. Church: Catalog offered in evidence as Defendant's Exhibit O, Universal catalog.)

Q. 208. You have followed this art of electric welding very closely?

A. Yes, sir.

Q. 209. Was or was not the use of spot welding machines rather slow at first? I mean to say, the use was not prevalent at once, was it?

A. It was not.

Q. 210. Can you account for the delay in the bringing of spot welding in such prominence?

(Mr. Fish: How is that material, your Honor?)

(Mr. Church: I think it will appear material.)

(The Court: You may answer.)

A. Yes, I can. In the first place, the process of producing articles with the aid of punch presses, while not new at the time—well, in the last 20 years—has developed very materially in the last ten or twelve years. Prior to that time, most of these things were made of cast iron or brass. Since that time they have drifted more to the production of parts in steel. Also, the public had to be educated in the use of electric spot welding. The majority of the people were afraid of electricity in practically every form, and the use of the alternating current was not anywhere near as general in 1901 to 1906 or '07 or '08 as it is at the present time, and most spot welders were built to operate from electric current.

Q. 211. Has the fact that sheet metal has replaced wood in many departments had any effect upon the use of spot welding machines?

A. Yes, sir, that has done more to increase the use of spot welding machines and encourage it than all the other things that have ever been done, that is, the substitution of sheet metal in place of wood—sheet steel.

Q. 212. Lest I forget it, I will now here ask you whether or not to your knowledge there are now on the market any steel-bladed fans, desk fans, that are spot welded?

A. I have never seen any steel bladed desk fans that were spot welded, other than those I have spot welded myself.

Q. 213. How are electric fans, such as is on his Honor's desk there, how are the fan blades of electric fans generally connected to their spiders?

A. Generally connected to their spiders by aid of rivets.

Q. 214. Have you gone to the different factories as well as to dealers to see if you could find some spot welded fans?

A. I have, and since this question has come up I have looked very closely for spot welded fans.

Q. 215. Can you account for the fact that with the prevalence of spot welding and the prevalence of electric fans, that have steel blades, there are not any that are united by spot welding?

A. They are more easily assembled when they punch the holes for the rivets both in the centers and in the blades.

Q. 216. Does it seem to be a more practical way of making fans?

A. It seems to be a more satisfactory process economically, as it eliminates the necessity of having jigs to hold them in place while they are welding.

Q. 217. Now, how are blades connected by rivets to their spiders, in modern practice? By hand operation or by machine? Has any improvement been made in that respect?

A. There has been a very decided improvement made in that respect, because they rivet those things by the aid of power, by compressed air power or electricity.

Q. 218. When the National Electric Welder Company with which you were connected began to manufacture and sell the spot welders in 1911, state whether or not the Harmatta patent in suit had been issued?

A. It had not.

Q. 219. Did you, or to your knowledge, did anybody, connected with the National Electric Welder Company know when that company embarked in business there was such a thing as the Harmatta application pending in the Patent Office?

A. They did not.

Q. 220. Had you ever heard of such a situation?

A. I never had.

Q. 221. When did you first learn there was a Harmatta patent or Harmatta application for a patent?

(Mr. Fish: That is objected to as immaterial.)

(The Court: It has some reflected possibility, I think. You may proceed.)

A. I did not know anything about it until after that patent was issued December 3, 1912.

Q. 222. When was the National Electric Welder Company notified of the infringement by the Thomson Electric Welding Company?

A. I think December, 1912.

Q. 223. Please examine the paper I show you and state if you know what it is?

A. This is a letter from the Thomson Electric Welding Company, Lynn, Mass., addressed to the National Electric Welder Company, Warren, Ohio, informing us that they had been granted a patent, giving the patent number as 1,046,066, granted December 3, 1912.

Q. 224. You were notified also in that of the infringement of another patent, were you not? What was it?

A. And also patent 928,701, granted July 20, 1909, was infringed by the machine we offered on the open market.

Q. 225. That last patent was the Reitzel patent, was it not?

A. It does not say so here.

Q. 226. It is a fact it was?

A. I take it for granted that must be it.

(Mr. Church: The paper referred to by the witness is offered in evidence as Defendant's Exhibit P.)

Q. 227. This, I see, was the notice of December 19, 1912, claiming infringement of the Harmatta patent, granted December 3, 1912; the Bill of Complaint in this case states that the suit in Boston against Barney & Berry on the Harmatta patent was brought March 13, 1913, and was tried in open court before Judge Dodge, April 1st, 2nd and 3rd, 1914; were you present at that trial, throughout the trial?

A. I was.

Q. 228. You were called as a witness for the defendant in that case and gave testimony, did you not?

A. Yes, sir, I did.

Q. 229. What did you expect to give testimony about in that suit?

A. Regarding the early use of spot welding by myself.

Q. 230. Did you testify in that suit as to the manufacture and sale or public use of steel-bladed, spot-welded fans by the Warren Electric & Specialty Company in 1901?

A. I did not.

Q. 231. Did you testify as to the prior use by you of such spot welded fans in 1901?

A. I did not.

Q. 232. Were you, while on the stand, not asked by defendant's counsel as to your early work of spot welding?

A. I was.

Q. 233. What did you answer?

A. I started to answer, but was not allowed to finish.

Q. 234. Why were you not allowed to answer?

A. Mr. Fish objected.

(Mr. Fish: State the ground, while you are on that line.)

Q. 235. I hold in my hand a printed copy of the record of appeal in the case of Thomson Electric Welding Company and Universal Electric Welding Company vs. Barney & Berry, Inc., in the Circuit Court of Appeals for the First Circuit, and find therein what purports to be your testimony given in that case on examination by defendants' counsel, Mr. Edwards, and you were asked as follows:

"Int. 22: When the National Electric Welder Company commenced to put these machines upon the market in 1911, did it have any knowledge of the pendency of the Harmatta patent in connection with spot welding of any kind?

A. Not any whatever.

Int. 23: You had never heard of Harmatta before?

A. Never heard of Harmatta.

Int. 24: Did you know that the complainant had any interest in any Harmatta patent or application?

A. Not any.

Int. 25: When you put these machines upon the market, was this your first acquaintance with this process of so-called spot welding?

A. It was not.

Int. 26: Had you ever practiced it before?

A. Yes, sir.

Int. 27: State when and where, and under what circumstances.

A. In the year 1901 I manufactured an electric welding machine—

(Mr. Fish: If this is by way of interest, it is not set up in the answer and therefore it is not competent.)

(The Court: I think I shall have to exclude that.)

(Mr. Edwards: And I save the exception, please.)

This record account of what happened in the Barney & Berry suit I have just read is what you attempted to explain in your testimony a few moments ago, is it not?

A. It is. That is what I had reference to.

Q. 236. Did Mr. Edwards, defendant's counsel in that suit, offer to you any explanation as to why you were not allowed to testify about your early work in 1901?

A. He did not.

Q. 237. Were any of the witnesses in support of your claim to having done this work in 1901 present there in court?

A. They were not.

Q. 238. Were any of them subpoenaed or asked to be present that you know of?

A. Not to my knowledge.

Q. 239. Were you surprised that you were not permitted to testify?

A. Very much so.

(Mr. Fish: That is objected to; whether he was surprised or not is not material.)

(The Court: I do not think that is material. That would be a matter better addressed to the court.)

Q. 240. Were you prepared to testify as to your early work in 1901 at the trial of the Barney & Berry suit?

A. I was to a certain extent.

(Mr. Church: Would it be advisable to have a very short recess? We had expected to ask your Honor to go out to the Ford works, but as it is too late, we will ask you to go out with us early in the morning. We cannot go tonight, because the works are shut down.)

(The Court: How long will it take to do that?)

(Mr. Church: Possibly three-quarters of an hour, going and coming.)

(The Court: We will take a short recess now.)

Recess.

Q. 241. (By Mr. Church). Mr. McBerty, I show you again this sample, Defendant's Exhibit M, and ask you to closely examine it and see if it is in the same condition that it was when you offered it in evidence before recess?

A. I would say that this sample in question has been scratched with some hard instrument, sufficiently hard to cut into the metal, right at the particular rivet hole about the center of the sample.

Q. 242. During the recess, were some sketches or drawings made of this sample by those in the court room?

A. Yes, sir.

(Mr. Fish: Show me what you mean by scratches.)

(Mr. Church: Now, may it please the Court, there is a very nice question here arising; we have put in our sample in good faith, and during recess this sample has been tampered with, and we now insist, with all deference, that the plaintiff should produce the counterpart of this sample. They have taken drawings and sketches of our sample, and I do not know what may be done overnight. If it does not correspond now, correspondence could be made over night, and I think good faith requires that the other portion of the sample be now produced for our inspection and for identification by the witness.

(The Court: Without at all intending to endorse the inferences that may be involved in what you have said to the Court, Mr. Church, it seems to me that there is no valid physical reason, at least, why the alleged counterpart of this sample should not now be produced, because seeing this, and assuming the counterpart is a similar end, the other part may be detached from the affidavit without any trouble and presented to the court as part of the affidavit, so that it might be preserved as part of the affidavit and then what might be unpleasant feelings of counsel thus avoided.)

(Mr. Church: Let us see what you have got, Mr. Stackpole.)

(Mr. Stackpole: I have sent one of my assistants for it in the clerk's office.)

(The Court: You say it is in the clerk's office?)

(Mr. Fish: There is no counterpart.)

(Mr. Stackpole: We have no counterpart of the fan blade.)

(Mr. Fish: What do you say we have a counterpart of, Mr. Church?)

(Mr. Church: The witness' testimony is it was a portion of the spider.)

(Mr. Fish: We haven't anything that fits that at all (referring to the part that has been brought in from the clerk's office).)

(The Court: Better leave that here; I will take charge of it.)

(The Witness: How can I tell it is the other part unless I examine it?)

(Mr. Church: I felt a little bit sore when the witness told me this had been scratched during the short recess we had.)

(Mr. Fish: It should not have been scratched or touched in any way, of course, and I don't know who did it.)

(Mr. Church: It may have been done inadvertently, but this is certainly a critical situation.)

(Mr. Fish: How do you know it has been scratched?)

(Mr. Church: The witness has sworn it has been scratched.)

Q. 243. (By Mr. Church). Before recess you were being interrogated in regard to the proceedings in the Barney & Berry suit, at which you were present. It appears from the record that has been read here of that suit that an objection was in effect made to your testimony in regard to your early work because it had not been pleaded in the answer; was any effort made at the time to have the answer amended while you were present in court?

A. Not to my knowledge.

Q. 244. Was there any effort afterwards made to amend the answer, according to your knowledge?

A. Not to my knowledge, no, sir.

(Mr. Stackpole: Mr. Church, may I handle this exhibit?)

(Mr. Church: Oh, certainly, sir (referring to Defendant's Exhibit M).)

(Mr. Fish: I do not know what they mean by counterpart, but there is all there is attached to the affidavit (handing to the Court).)

Q. 245. During the progress of the Barney & Berry suit, I mean, in the trial of that suit, what, if anything, came to your knowledge or was brought to your attention indicating that a settlement or understanding between plaintiff and the actual defendant in that suit was in progress?

A. My first intimation——

(Objected to.)

(The Court: The witness cannot testify to anything except what he had direct knowledge of. If he heard any conversation between the parties, he may testify to that.)

A. My first intimation of this trial coming off on the 1st day of April, 1914, was a telegram from Boston requesting my presence there on the morning of April 1st, to attend that trial as a witness. I do not remember the exact wording of the message or just how it was signed.

(The Court: Did you go?)

A. I got it the day before the trial and I promptly took the train and was there the first of April. After we had attended the court that day, I spent the evening with Mr. Frank Warren, who was at that time, I believe, the general manager of the Toledo Electric Welder Company of Cincinnati, Ohio. Mr. Warren was very much exercised over the condition of affairs. We went out and had a little lunch together, and we walked the streets a while and he told me what his troubles were. Mr. Warren said he had——

(Objected to.)

(The Court: This all took place away from the plaintiff or any representative of the plaintiff, so it is not competent.)

(Mr. Fish: Another objection is that Mr. Warren is dead.)

(The Court: I cannot say that is as valid an objection as the other.)

(Mr. Church: I think what the witness is trying to tell, if

permitted, has relation to this Barney & Berry Company only as a nominal defendant, suit being actually defended by the Toledo Welder Company with Mr. Warren as its representative. What the witness desires to tell, if permitted, is in regard to the negotiations that were going on between Mr. Warren and the plaintiff during the trial.)

(Mr. Fish: No, he wanted to say something that Mr. Warren had said.)

(The Court: He cannot testify to anything Mr. Warren said. If he had any negotiations himself, or if he has any direct information as to that, he can testify to it.)

(Mr. Church: I think he was, because we will show ultimately that immediately this patent was sustained, the Toledo Company was sold out to the plaintiff. I understood Mr. Fish to say that.)

(Mr. Fish: I did not say immediately, but some time after, negotiations were taken up. A trade was made by which the Toledo Company was bought out in settlement of this litigation. No question about that. I have hardly ever been engaged in a patent suit but what I have tried to settle it the very day suit was brought. But there were no negotiations of any kind during that trial.)

(Mr. Church: We are leading up also to the report Mr. McBerty made to his counsel as to what he discovered on that trial. The letters are here, showing this is not a new story, but it was the impression at the trial. It seems to me it is competent, because if they rely upon an adjudication as having sustained their patent, they ought not to be permitted to have the suggestion made that the suit was honestly tried, and all the defenses presented. Our idea is this McBerty defense was suppressed for some reason or other, whether a good reason or bad, but it was suppressed. He went on to testify and was not permitted to testify. And, furthermore, if permitted, we will show negotiations for a settlement were made all during that suit, and he went home and reported as to what he had heard, and indicated he was well satisfied there had been a settlement when the case should have been fought out.)

(Mr. Fish: The suggestion my brother Church makes I think is nothing less than outrageous, and it should not be made without some scintilla of evidence; if he would approach it with any evidence, we would meet it, but scandalous attacks are not evidence.)

(The Court: I think that is so. What this witness says is private conversation with Warren and is not competent testimony, nor what he reported to his counsel of his impressions at the time would be competent testimony, not now anyhow, but if he himself was a party to the negotiations or overheard any of the negotiations, or saw anything that tended to suggest a process of negotiation, that would be competent.)

Q. 246. (By Mr. Church). You were interested in the negotiations, were you not?

A. Yes, sir, I was.

(Mr. Church: Of course, he would be liable as an infringer and in a sense he was taking part in them, and then he was to get rights.)

(The Court: And did that proposition come to him from the plaintiff?)

(Mr. Church: That I don't know.)

(The Court: It is only what this witness is able to tell us and knew what the plaintiff did that can be evidence in this case.)

(Mr. Fish: This is a minor matter, but the Court may be interested in knowing there is no suggestion of this in the answer.)

(Mr. Church: I will withdraw the question.)

Q. 247. (By Mr. Church). Before this suit of Barney & Berry came on, you went to Boston to confer with people connected with the Thomson Welding Company, did you not, the predecessor of this plaintiff?

A. Yes, sir, I did.

Q. 248. Whom did you meet in that connection?

A. I met, first, Mr. Hodges. By the way, this was at Lynn, Mass., not Boston. Then Mr. Hodges called in a gentleman by the name of Mr. Spinney, who, I understood, was the president of the Thomson Electric Welding Company. And, later on, they had Mr. Elihu Thomson come over there to the plant, and I talked with him, and at their request—

Q. 249. What did you talk about?

A. We talked about the prior use of the art.

Q. 250. Art of what?

A. The prior use of spot welding.

Q. 251. By you?

A. Yes, sir.

(The Court: About this use you have been testifying to here?)

(The Witness: Yes, sir, exactly the use I have been testifying to here, the use of this particular machine and this particular job. Mr. Hodges did not pay much attention to it at first, until I showed him that piece of sample, and he took it up with Mr. Spinney, had Mr. Spinney come in, and we talked it over again, and they asked me if I would not oblige them by going to Boston in the morning and seeing Mr. Fish and telling him what I had told them, which I agreed to do. And they arranged, I think, by telephone for a meeting between myself and Mr. Fish at, I believe, it was 86 State Street, Boston, the following morning at nine o'clock. I called there and explained to Mr. Fish what I had done, showed him my sample, told him who I was, what my business relations were, the firm I was connected with, and asked him if they were in position to make an arrangement with me whereby I would not be disturbed in my manufacturing interests, or whether they could see any way to make a proposition to me to permit me to get out of the business and avoid any litigation. Mr. Fish's answer was—I cannot give it in the exact words, but it was something to the effect, after thinking over what I had told him, his impression was this work had been done in the light of an abandoned experiment, and he did not know whether he was in a position to suggest any deal that we might make that would permit me to get out of the business, as he was not in control of the Thomson Welding people. My suggestion was that the Thomson Welding Company would buy me out, and I would quit that line of business.)

Q. 252. How long did that interview with Mr. Fish last?

A. I would say 20 or 30 minutes, not much longer than that; it did not take very long.

Q. 253. What did you show Mr. Fish in that connection?

A. I showed Mr. Fish the other portion of this fan.

Q. 254. Did you have this portion of the sample with you?

A. No, sir, I never had this portion of my sample away from the plant at Warren, Ohio.

(The Court: Was it that spider of which this Exhibit M is a part?)

(Mr. Fish: Your Honor understands what the spider is, it is not the blade.)

(The Court: Oh, yes, I understand. It is the cross over to which the blades are attached. Did that have all four blades attached to it, originally?)

(The Witness: No.)

Q. 255. How many blades did it have?

A. It had three blades, if my recollection serves me right, and they were cut diagonally across, leaving him that short stub, which never had anything welded on, and the one section of the blade, which I have there.

Q. 256. This is not a complete blade?

A. No, that blade has been cut off. The upper end has been cut off. There were, I think, originally two complete blades.

Q. 257. And that particular portion of the blade was cut off?

A. Yes, sir.

(The Court: Was this originally complete, or was it a piece you picked up and put on?)

A. That was originally complete.

Q. 258. Was it cut off after it was welded to the spider?

A. Yes, sir, cut off quite a long while after it was welded to the spider; the outer end, the widest end was cut off.

Q. 259. (By Mr. Church). That was what you showed to Mr. Fish?

A. Yes, sir.

Q. 260. Did you have any other samples of your spot welding work at that time?

A. I don't remember of having any particular sample, excepting that blade and the short piece of a sample.

Q. 261. Did you submit to Mr. Fish any affidavits?

A. I had affidavits from Mr. F. G. Brown and E. C. Lipps, two men who formerly worked with me in the Warren Electric and Specialty Company's plant, and who had knowledge of this machine, and these were the men that I recollected as being men exceptionally skilled in mechanical lines, and being the most convenient to get at, for I wanted to get evidence of sufficient backing to substantiate the facts pertaining to this original welding and what I had done with it. These affidavits I got myself.

Q. 262. What became of that part? Did you leave it with Mr. Fish or take them away?

A. I think I took them away. My impression is I returned the others, and they were turned over to Mr. McGill.

(Mr. Fish: To Mr. McGill?)

A. Yes, sir, to J. Nota McGill.

(Mr. Church: I presume it will be admitted, it has not already been adequately proved yet, that a sample or part of a sample of spot welding work was given to Mr. Edwards by

Mr. McBerty or by his attorney, Mr. McGill, and was turned over by Mr. Edwards to the Spot Welding Company. Is that admitted?)

(Mr. Fish: The only thing we admit, as far as I know, and the whole truth is, that we have a series of affidavits that were taken by Mr. Howe for Mr. Edwards in order to give him an opportunity to determine whether it was necessary to put in this defense. That set of affidavits is all I know of. Nothing else of any sort or kind, except this full set of affidavits that Mr. Howe took.)

Q. 263. (By Mr. Church) Mr. McBerty, I show you a paper and ask you to state, please, what it is.

(Mr. Fish: Before he reads it, I would like to see it, Mr. Church.)

(Mr. Church: Yes, it is a letter of transmission, of—or a copy of—of the blade to his counsel, Mr. McGill.)

(Mr. Fish. Is that material, a letter of transmission of something to his own counsel?)

(The Court: You may examine on it.)

Q. 264. What does that purport to be?

A. That is a letter in answer to a request of Mr. McGill for sample or specimen of fan blade—

Q. 265. What is the date of that?

A. February 1st, 1913.

(Mr. Church: I offer in evidence the letter transmitting a fan blade to Mr. McGill.)

(Mr. Fish: You offer to prove the fact he did transmit the fan to Mr. McGill?)

(The Court: There is no contest on that subject, is there?)

(Mr. Fish: This exhibit I never heard of and don't know anything about it, and this certainly does not tend to prove the fact. He says:

"Mr. Edwards is out of the city"—)

(The Court: What I want to know is this: This is offered only to prove that the sample in question was transmitted by Mr. McBerty to Mr. McGill?)

F. P. McBerty.

(Mr. Fish: No, there is something about Mr. Edwards. I don't know what. Will your Honor read the letter, and your Honor can see what it is.)

(Mr. Church: I offer it in evidence. It reads:
"February 1st, 1913.

J. Nota McGill,
McGill Bldg., Washington, D. C.

Dear Sir:

Re, Your letter January 29th, 1913.

We forwarded you today by parcel post (registered) the fan blade which was spot welded in 1901 or thereabouts.

We could not give this more prompt attention due to the fact that Mr. McBerty was out of the city, and the writer could not get into the box in which he keeps his valuables (?)

Hoping this arrives without any unnecessary delay, we are
Very respectfully yours,

THE NATIONAL ELEC. WELDER CO.

By

ZAM/LS

Assistant Sec'y.

I offer that in evidence as Defendant's Exhibit Q.)

Q. 266. Please examine the letter I now show you and state what it is.

A. This is a letter under J. Nota McGill's heading, dated the 29th of January, 1913.

Q. 267. And that is the letter that calls for a fan blade, is it not, calls upon you for a fan blade?

A. Yes, sir; it says:

"Please send me one of the fan blades which was spot-welded in 1901 or thereabouts. I mean one of the two which Mr. McBerty showed me when last in Warren. Let him mark it in some way so that he can hereafter identify it when returned."

Q. 268. That is the letter to which this was a reply, that you offered a moment ago, because this states:

"Re, Your letter January 29th, 1913. We forwarded you today by parcel post (registered) the fan blade which was spot welded in 1901 or thereabouts."

That is correct, is it not?

A. Yes, sir.

(Mr. Church: I offer this letter of Mr. McGill's, dated January 29th, 1913, as Defendant's Exhibit R.)

(Mr. Fish: This is clearly objectionable, but I don't object to it, particularly, as it has my name in it.)

Q. 269. Now please examine the letter I now show you.

A. This is another letter from J. Nota McGill, dated February 3rd, 1913.

Q. 270. What does it say about the blade welded in 1901?

A. It says:

"I have your letter of the 1st instant and also the blade welded in 1901. Mr. Fish advises me that he may be able to make an appointment for some day next week."

(Mr. Church: The letter is offered in evidence as Defendant's Exhibit S.)

Q. 271. Now please examine this letter and tell what it is.

A. This is a carbon copy of a letter addressed to Messrs. Edwards, Sager & Wooster, United States Express Building, 2 Rector Street, New York City. Dated: January 20, 1917.

Q. 272. From whom is that letter?

A. This is from the National Electric Welder Company, per the secretary and treasurer.

Q. 273. Is there any reference in that letter to the fan blade sample, if so, read it out.

A. It says:

"If you will remember Mr. Warren and yourself requested us to supply such information as we had available regarding the prior use of the art, and the writer mailed you at that time, a sample of an electric fan blade, which was spot welded together with some affidavits covering the process, and sent for the facts in connection with the operation, as would be of interest in the defense of the suit.

"We would be pleased to have you return to us at your earliest possible convenience samples, and the affidavits, as I understand that the information contained in the affidavit and the sample were not used at the trial at that time, and we would like to have this information at our hand here, in case we found it desirable to use it at some future date.

"As the writer understands it, the Toledo Electric Welder Co. have liquidated, and have been taken over by the Thomson Spot Welder Company, and we would like to know what your opinion was, regarding the handling of this case, now that the matter is closed."

It is signed by the National Electric Welder Company, Warren, Ohio.

Q. 274. Who signed that letter?

A. It is apparently written by me.

(Mr. Church: It is offered in evidence as Defendant's Exhibit T.)

(Mr. Fish: I object to that letter, but if your Honor overrules it, I will offer no protest.)

(The Court: It is admitted.)

Q. 275. I now show you copy of a letter and ask you what it is and from whom it was received?

A. This is a copy of a letter received from Edwards, Sager & Richmond, 2 Rector Street, New York, addressed to F. P. McBerty, National Elec. Welder Co., Warren, Ohio:

"Dear Sir:

Replying to your letter of inquiry regarding the sample of fan blade and affidavit, we beg to say that we examined this matter very carefully at the time it was presented and did not press the point of the exclusion of the evidence by Judge Dodge because, in our opinion, it would have been ineffective against the Harmatta patent. We considered that it would have been regarded by the court as an abandoned experiment. We understand that the National Electric Welding Company, as well as practically all other makers of welding machinery in the United States, is now licensed under the Harmatta patent, and, in view of the fact that the preparation of the affidavit was entirely paid for by the Toledo Company, and in view of the fact that the assets of the Toledo Company have been transferred to the Thomson Spot Welder Company, the affidavit and sample are now the property of the Thomson Spot Welder Company and cannot be delivered without an order from that company. Will you, therefore, take the matter up directly with the Thomson Company?

Yours very truly,

EDWARDS, SAGER & RICHMOND."

(Mr. Church: That is offered in evidence as Defendant's Exhibit U.)

(Mr. Fish: I will go through the form of objection, but expect it to be overruled.)

(The Court: It is admitted.)

(The Witness: It was upon that showing we called upon them for the sample and the sample we thought we were going to get does not appear, and where it is, I don't know.)

(Mr. Fish: What is referred to is the sample attached to this affidavit?)

(The Court: The record will explain itself in that respect. Of course, you may have a different construction of the record.)

(Mr. Church: There are one or two questions I cannot well put to the witness until we have seen the welding machine and operated it, and, accordingly, although I regret to ask for an adjournment, I think that will have to be done.)

(The Court: I am not very sanguine now, at the end of the first day, that we can get through by Wednesday. It is long past the usual hour of adjournment, because I thought you would be willing to stay a little longer. If you can use the time, we can proceed for a few minutes with another witness.)

(McBerty's testimony continued, page 276.)

OTTO F. BARTHEL.

OTTO F. BARTHEL, after being duly sworn on behalf of the defendant, testified as follows:

Direct examination by MR. CHURCH:

Question 1. Please state your name, age, residence and occupation.

Answer. Otto F. Barthel; age, 43; patent attorney, residence, Detroit, Michigan.

Q. 2. You were requested to make search in all likely places for one of the steel-bladed, spot-welded fans said to have been put out by the Warren Electric & Special Company in the year 1901. Will you please tell the Court what you did in that behalf, and the result of your effort.

A. I caused certain advertisements to be placed in various papers throughout the country in the principal leading cities like Chicago, Cincinnati, Boston and other places, advertising for a fan of this type G, and to which I received a number of replies, but on running down the various replies, the particular fan we were seeking for, sample of G-2, we did not find. I found a number of Peerless fans, and, as I say, I got numerous replies, but there wasn't a single case where we found the type G-2 fan with the spot welded blades. I have a large number of these letters here if you care to see them, also copies of the advertisements from some of the papers.

Q. 3. You are willing to submit those for cross-examination, are you?

A. Certainly.

Q. 4. What else did you do in the way of making an investigation to endeavor to find any of those fans? Did you make any personal investigation?

A. I made a great many, visiting a great many concerns, princi-

pally second-hand dealers and electric dealers in Philadelphia, for example, and, as I say, ran across a great many fans, some of the Peerless make, even, but none of the spot welded blades. I also went to New York and stayed a week and visited a great many of the second-hand stores, and electric jobbing houses along Center Street, I believe it is, but without any success there, although I did find Peerless fans. I can give you a list of some of these places I called at if you care for it.

Q. 5. If you can conveniently do it, suppose you do so. I think it would be sufficient to give a list of the places if you have it before you, and the list of the newspapers in which you advertised.

A. This was in 1918, one trip I know of, was along the early part of July, and the other was, I believe, in April. I called at the Hanover Electric Company, 42 Beaver, near Broad Street. On T. B. Laetham & Company, 4 Murray Street, New York City, and I have a memorandum here of seeing G-2 fans, or that they handled G-E fans. I called at Edgar A. Goetz, 55½ Brooklyn Avenue. C. C. Davey Electric Shop, 826 Fourth Avenue, near Forty-sixth. N. S. Newman, 49 Maiden Lane, second-hand dealers. Bernard G. Goldberg, 120 Center Street. He was a second-hand dealer also. I found a lot of fans there, but not the one I was after. On Swartz & Allen, 207 Center Street. They were second-hand dealers. Nathan Klein & Company, 208 Center Street. I found a lot of fans there, but no Peerless at that time, I think. He told me he had sold five shortly prior to that. And the Aneco Motor Electric Company, 217 Center Street. They had no fans there. The Reliable Electric Motor Company, 165 Grant, corner of Center. They had lots of fans there, but not the one I was after. E. S. Gray, 120 Center Street. They had a small E-2, 16-inch direct current fan of that type. George Binder, 920 Center Street. They did not have any. I called at 168 Center Street; they had two fans there, one with the ring, but not of the particular type I was after. On Benjamin, 170 Center Street. He had a lot of fans, but not the one I was after.

Q. 6. Without reading more names, how many more names have you on the list?

A. There are quite a few more here. I can give you some names in Philadelphia if you want.

(Mr. Stackpole: If you want the list, why not prepare it and file it?)

(Mr. Church: I do not think that would be necessary.)

Q. 7. Please state how many places you went to.

A. Well, I went to at least, I would say 15 places in Philadelphia.

Q. 8. Did you investigate in any other city?

A. At Cleveland I looked around some, and in one or two other

cities where I happened to be casually, making trips but not special trips. I might state I found, however, in going to a good many of these places, particularly in Philadelphia, that the people remembered of someone else having been there looking for a fan about a year previous to my visit. I also found among dealers when I made this search in 1918 that they stated it was a very hot season the year before, and they were pretty well cleaned out with second hand fans, and they counted that as one of the reasons why this kind would be practically unprocurable. In some places where I went, Mr. Smith, I believe they told me, had been there looking for fans also.

Cross-examination by Mr. STACKPOLE:

X-Q. 9. You say Mr. Smith. You mean Captain Smith?

A. I believe it was, but I have not the initials here.

X-Q. 10. The one who testified in this case for the defendant?

A. I could not say, I have not the initials here, but that was the impression I labored under.

X-Q. 11. Did you get any Peerless fans with steel rings?

A. I could not say as to that; I was not particularly interested in the steel rings.

X-Q. 12. Did you get any Peerless fans with steel blades?

A. I don't believe so, although I think at the Colonial Hotel, on top of the telephone booth there was one with black enamel, I believe.

X-Q. 13. You don't know whether it was steel or not? Did you examine it?

A. I did not take it in hand. It was six or seven feet up above the floor line.

X-Q. 14. And the blades were riveted?

A. Yes, but they looked to be black instead of brass.

X-Q. 15. And that was the only one—

A. That might have been from age. In most of those second-hand shops the fans you look at are so dirty and the places are so unsuited to make an investigation that you have to have overalls on to do it well.

X-Q. 16. Did you run across any Type G-2 fans with blades riveted to the spiders?

A. My impression is that I did, but in this memorandum I do not find any. I find E-2. I think though I had a reply to an advertisement stating they had a G-2.

(Mr. Stackpole: That is all, your Honor.)

(The Court: We will adjourn until ten o'clock tomorrow morning, going to the Ford plant first. We will start from here at a quarter past nine.)

(Then adjourned.)

Tuesday, May 20th, 1919.

Court re-convened at 11 A. M., with the same parties present.

F. P. McBERTY resumed the stand and his direct examination was continued as follows:

Examined by MR. CHURCH:

Q. 276. Will you please examine this letter which I now show you and state what it is, and by whom it was received, and from whose possession it came?

A. This is a letter from J. Nota McGill, dated Washington, September 2nd, 1913 advising that he had received a letter from the National Electric Welder Company, Warren, Ohio, of the 30th of August, enclosing the letters of the use witnesses. It says:

"These I shall turn over to Mr. Edwards on Friday next, nothing preventing, together with copies of the affidavits, the sketch, and the fan blades. I think it would be of great assistance to Mr. Edwards if Mr. McBerty could be with him when examining our witnesses. Of course, the Toledo Company would have to pay the expenses of his trip.

"As I am sailing direct for Antwerp I shall hope to see Mr. McBerty's brother.

"Possibly if Mr. Warren calls on the British Company they may agree to waive the balance.

Very truly yours,
J. NOTA MCGILL."

Q. 277. To whom is that letter addressed?

A. To the National Electric Welder Company, Warren, Ohio.

Q. 278. And it is produced from the files of that company?

A. It is.

(Mr. Church: I offer it in evidence as Defendant's Exhibit V.)

Q. 279. I also hand you another letter and ask you to state the date of it, from whom it was received, by whom it was received, and from whose custody it has been produced.

A. This letter is signed by J. Nota McGill, dated September 5, 1913.

Q. 280. Is there any reference in the letter to the fan blades, if so, please read it to the Court.

A. It is addressed to the National Electric Welder Company, Warren, Ohio, and the first paragraph reads:

"I have had an extended interview with Mr. Edwards, the attorney for the Toledo Company, and have turned over to

him the several notes of introduction of use witnesses and copies of their affidavits and the specimen fan blade."

(Mr. Church: I offer this in evidence as Defendant's Exhibit W.)

(Mr. Fish: Let me see it, please. It is objected to as pure hearsay. I rather hope your Honor will overrule the objection.)

(The Court: Oh, it is undoubtedly pure hearsay. Are you making an objection? At any rate, you don't care whether it goes in or not, that is, evidence of this character?)

(Mr. Fish: I don't know that I want to have that excluded. We recognize its objectionable character, but we are willing to have it go in.)

Q. 281. Please examine the letter I now show you and state the date of it, to whom it is addressed, by whom it is signed, and from whose custody the letter is produced.

A. It is on the letterhead of Edwards, Sager & Wooster, 2 Rector Street, New York, addressed to F. P. McBerty, c/o National Electric Welder Company, Warren, Ohio, dated September 20, 1913. It refers to the spot welding suit.

Q. 282. Will you please read the first paragraph?

A. (reading)

"We have received from Mr. McGill the data regarding the early use of spot welding by the Warren Company. We would like to send Mr. Howe, of this office, to interview yourself and the other witnesses of this use in order to put the matter in the shape of affidavits, and also to investigate any collateral evidence that might be developed in order to corroborate the various witnesses."

(Mr. Church: I offer that letter in evidence as Defendant's Exhibit X.)

Q. 283. I notice in the letter from Mr. McGill to the National Electric Welder Company this statement:

"Please send me one of the fan blades which was spot-welded in 1901 or thereabouts. I mean one of the two which Mr. McBerty showed me when last in Warren. Let him mark it in some way so that he can hereafter identify it when returned."

Please state whether you did mark a blade and send to Mr. McGill in response to Mr. McGill's letter, and how you did mark it.

A. I did mark it; and I stamped it with my private stamp, name, F. McBerty.

Q. 284. With what did you stamp your name?

A. With the same steel stamp shown in evidence here yesterday.

Q. 285. Mr. McBerty, over how long a period have you given attention to this subject of electric welding?

A. Ever since 1901.

Q. 286. And have you been intimately connected with it since that time?

A. To a certain extent all the time since.

Q. 287. Now state the range of thickness of plates that may be spot welded as demonstrated by actual tests or performances made by you.

A. I have welded plates ranging from one to two pieces of stock, .005 in thickness, up to material that consists of two pieces $\frac{7}{8}$ of an inch in thickness.

(The Court: You mean a combined thickness of $\frac{7}{8}$ of an inch?)

A. No, the thickness of each piece.

Q. 288. I show you some plates welded together and ask you to tell the court the thickness of those plates.

A. Those plates are approximately $\frac{1}{8}$ inch in thickness.

Q. 289. How are they connected?

A. Spot welded together.

Q. 290. How much does one plate overlap the other?

A. That is about $\frac{1}{4}$ of an inch, maybe a trifle more or less.

Q. 291. Who welded these plates together?

A. I did.

Q. 292. When?

A. Last week.

Q. 293. Did you do it at my request?

A. Yes, sir.

Q. 294. Tell the Court what kind of an electrode you used on that weld?

A. On this particular job the lower electrode was $\frac{3}{4}$ of an inch in diameter across the flat top round; the other electrode was $\frac{3}{8}$ of an inch thick across the point of contact on the metal. That is, it was rounded to $\frac{3}{8}$ inch diameter at the point of contact.

Q. 295. It was rounded to $\frac{3}{8}$ of an inch at the point of contact, you say?

A. Yes, sir. The bearing surface was flat at the end of the electrode placed?

Q. 296. How near the end of the upper plate was the small electrode placed?

A. The point of the electrode was placed, as near as I could get it with the eye, perfectly even. The two edges were in a direct line vertically.

Q. 297. Would you call the welding shown on that exhibit as spot welding?

A. Yes, sir.

Q. 298. Are the welds on that exhibit surrounded by portions of unwelded metal?

A. That is difficult to say, but I would say one or two of them were, and one of them was not—on one plate.

Q. 299. Do these welded portions serve the purpose of rivets?

A. They do.

(Mr. Church: I offer these plates in evidence and ask they be marked Defendant's Exhibit Y.)

Q. 300. Will you take the two plates I now show you and state what they represent, the thickness, and how they are connected?

A. These are a couple more pieces of $\frac{1}{8}$ inch stock steel; they have been lapped over about 1 inch and apparently two spot welds put in, so that they would go through at the center of the lap, and the third spot weld has been put in there very close to the edge.

Q. 301. Would you characterize all these weldings as spot welds?

A. Yes, sir.

Q. 302. Was there any difference in the process or method of producing those several welds?

A. Absolutely not; the only difference being the work was shifted between the electrodes before the weld was made.

Q. 303. But the process was the same?

A. The process was identically the same, and apparently the current and the points of contact were the same.

(Mr. Church: I offer these plates in evidence and ask that they be marked Defendant's Exhibit Z.)

Q. 304. If you take a conventional electric spot welding machine and fasten two plates together by means of pressure, and current applied at the part where you desire to weld, is the process different, whether you make the weld in the middle of the sheet, or remote from the edges, or at the edges on the sheet or anywhere else on the sheet?

A. It is not.

Q. 305. The same identical process?

A. The same process in every instance.

Q. 306. And welds so made are what are called conventional spot welds?

A. They are called conventional spot welds, yes, sir.

Q. 307. Please examine now the pieces of metal that I hand you and state to the Court what they represent, how the plates of

each set were connected together, and by whom they were connected?

A. I have one sample here now that is marked C. S. K.—3.

Q. 308. By stamp?

A. Yes, sir, by stamp, and it consists of two pieces of stock that are approximately $3/32$ of an inch in thickness, each. Apparently, I would say, have had a hole drilled through, and the rivet put in place in the hole, and then placed between the electrodes of a spot welding machine and the rivet, as well as the adjoining metal, is spot welded together.

Q. 309. What was the character of the electrodes employed in making that weld?

A. Why, copper point electrodes, such as in an ordinary machine.

(The Court: Is this your own work?)

(The Witness: Yes, sir.)

Q. 310. When did you do it?

A. This work was done this year, but I can not say the exact date.

Q. 311. Comparatively recently?

A. Yes, sir.

Q. 312. And with a view of determining what?

A. Whether rivets can be placed in the hole for the rivets, and the surrounding metal welded with the aid of the spot welding machine.

Q. 313. Did you tell the form of the electrodes employed?

A. They were regular flat electrodes.

(Mr. Church: The sample referred to is offered in evidence as Defendant's Exhibit 52A.)

(The Court: Will you let me see that please?)

(Witness hands Exhibit 52A to the Court.)

Q. 314. In like manner describe the others you have in your hand.

A. I will do that. I have another specimen here marked C. S. K.—3, which consists of two plates of approximately $3/32$ in thickness, steel, which has been drilled, rivets placed in, and the rivet ends and the adjoining plates joined together with the aid of the spot welding contact machine.

Q. 315. What do you say as to the character of the electrodes used in making that?

A. Those were the regular spot welding electrodes, flat on the end.

(Mr. Church: I offer that in evidence as Defendant's Exhibit 53A.)

(The Witness: I have a third sample here marked S.—4, which is the same grade of material, the same thickness, approximately, which is spot welded, apparently with the regular—)

Q. 316. You say apparently. Do you know?

A. It indicates there were flat contacts here, although with a slight depression, but it was a regular spot welder, cut open through the center.

Q. 317. What was the character of the electrodes in making that?

A. Standard flat contact electrodes.

(The Court: What did you say was the diameter of the electrodes?)

(The Witness: I did not mention.)

Q. 318. What was approximately the diameter of the electrodes used?

A. About $\frac{3}{8}$ inch. You only see a small portion of the circle. I have another sample marked R. H. 4, which is of the same material, the same thickness and has had a hole drilled and the rivet extended through the material on both sides, put in position, and headed over with a bar which had a countersinking or recess in the end of it, to form a rivet head.

Q. 319. You regard that as spot welded?

A. That is difficult to say, but the indications from the appearance of the joint is that it is welded at the point of contact between the two plates surrounding the rivet.

(The Court: Let me see that, please.)

(Handed to the Court.)

(Mr. Church: I offer that in evidence as Defendant's Exhibit 55.)

Q. 320. You were present at the Ford plant in this city of Detroit this morning and operated a machine there, a welding machine, in the presence of Judge Killits and of counsel for plaintiff and defendant, were you not?

A. Yes, sir.

Q. 321. What machine was that?

A. That was an electric welding machine, built at the plant of the Warren Electric and Specialty Company in 1900-1901.

Q. 322. Is that the machine about which you have testified in your previous examination?

A. It is.

Q. 323. What parts of that machine, as it now stands, are original parts that were used in 1901?

A. The transformer, the square heads, the main contact, the bed plate of the machine, the movable bars, and the mount on top of the bed plate, and two of the handles arranged with cam rod for operating the movable handles.

Q. 324. Are we to understand the other two handles are not originals, that is to say, were not on the machine as originally constructed in 1901?

A. Yes, sir, they were not original with the machine.

(The Court: What was not original with the machine?)

(The Witness: The two short handles. They were lost after the machine was discontinued in use.)

Q. 325. (By Mr. Church) You were asked to do some work on this machine in the presence of the Court, were you not?

A. Yes, sir.

Q. 326. I hand you a fan and ask you to state what it represents.

A. This is a set of fan blades with their steel center, such as is used on electrically operated desk fans.

Q. 327. How are the blades and center connected?

A. Spot welded together.

Q. 328. When was it done?

A. It was done this morning.

Q. 329. In the presence of the Court?

A. Yes, sir.

Q. 330. And upon what machine?

A. On the original welding machine, built in 1900-1901.

Q. 331. Who operated this machine when this was produced?

A. I did.

(Mr. Church: The fan is offered in evidence as Defendant's Exhibit 56.)

Q. 332. I show you another piece of work and ask you to state what it is.

A. This is a couple of pieces of material stamped out with a die that was used in producing the fan blades.

Q. 333. How are they united?

A. By being spot welded together.

Q. 334. When was it done and by whom?

A. Done this morning by myself.

Q. 335. Upon what machine?

A. On the electric welding machine built in 1900-1901.

Q. 336. Was this also done in the presence of Court and counsel for the plaintiff?

A. It was.

(Mr. Church: It is offered in evidence as Defendant's Exhibit No. 57.)

Q. 337. What is the thickness of the plates in the last exhibit, approximately?

A. I can not tell about the thickness of that material. It is somewhat heavier than the regular standard fan blade. It was a piece of material I had with me, brought over here to demonstrate the welder, and it is approximately $1/16$ of an inch, I would say.

Q. 338. Please examine the specimen I now show you and state if you know what it represents.

A. Two pieces of $1/8$ inch stock, $1\frac{1}{4}$ inch wide, spot welded in three places.

Q. 339. When was that work done?

A. That was done this morning.

Q. 340. On what machine?

A. On the same electrical machine manufactured in 1900-01.

Q. 341. In the presence of the Court?

A. Yes, sir.

Q. 342. What was the thickness of this weld?

A. Approximately $1/8$ of an inch each.

(Mr. Church: It is offered in evidence as Defendant's Exhibit No. 58.)

Q. 343. I notice in this Defendant's Exhibit 57 the welds are made at a variety of places; there is a line of them, or succession of them, more properly, beginning near the middle of the blade and extending to the edge, and then inwardly and to the opposite edge. Two of the welds appear to have been made at the edge; state whether or not you would characterize all those welds as spot welds?

A. Every one of them is a spot weld.

Q. 344. Was there any difference at all in the method or process of producing those welds?

A. Absolutely none.

(The Court: Let me see that.)

(Witness hands Exhibit 57 to the Court.)

Q. 345. The same steps were taken in the production of each one of those welds, were they not?

A. Yes, sir.

Q. 346. You were requested by Judge Killits to put into the machine out there some pieces of wire with a view of butt welding them?

A. Yes, sir.

Q. 347. Did you do so?

A. I did.

Q. 348. Please examine the samples I now show you and state, if you will, what they represent?

A. They represent the butt welding I did at this time

Q. 349. State what you did in order to change from spot welding to butt welding these rings on that machine this morning?

A. I removed my copper electrodes, or spot welding points, and placed the iron rings in the position formerly held by the spot welding points, that is, between the clamping jaws.

Q. 350. State whether or not you changed at all the distance between the terminals?

A. The clamps?

Q. 351. Yes, the clamps.

A. No, I did not.

Q. 352. Were those clamps in position for spot welding when you used them for butt welding?

A. Yes, they were in the same position as they were when I used them on the spot welding machine this morning.

Q. 353. If you had prepared in advance that machine for butt welding, how differently, if at all, would you have arranged the clamps or terminals?

A. I would have placed the machine so the clamps would have been very much closer together, possibly $\frac{1}{4}$ or $\frac{3}{8}$ of an inch.

When you are butt welding, your metal heats up between the pieces and as soon as it heats up, it loses its strength or stiffness, and there is a tendency of these pieces to fly up, which occurred in this instance, as they had not sufficient strength. Another thing, these rings were not formed up in a ring-forming machine, they are bent up by hand, and were not round, and consequently, I did not get as good an alinement as I should.

Q. 354. You made this emergency application of butt welding at the request of the Court, did you not?

A. I did.

Q. 355. How do those rings you held in your machine and which were butt welded on your machine compare as to size and diameter with the rings that were butt welded on that machine in 1901 for the guards of fans, as you have described?

A. We butt welded rings of approximately this diameter, and other rings from $13\frac{1}{2}$ to $17\frac{1}{2}$ in diameter.

356. In order to do this butt welding as you have described, you substituted for the steel clamps you had there, a copper clamp?

A. No, both were of copper, but I did substitute in the set one that had a groove in there that fitted the rod.

(The Court: Did I understand you to say yesterday that the holes on one side of each clamp was grooved?)

A. It was grooved to fit the ring, to give the alinement of the ring itself.

Q. 357. And they were used in a flat position?

A. We used those rings in a flat position, and then I had the grooves fit inside of the ring. In other words, we used one flat

die and a corner grooved die with the groove to correspond with the ring.

(Mr. Church: I offer this in evidence as Defendant's Exhibit 59.)

(The Court: These rings were inserted in a perpendicular position this morning?

(The Witness: Yes, they were inserted in a perpendicular position.)

(Mr. Church: I have marked these rings respectively Exhibits 59, 60 and 61.)

Q. 358. How much current was used in that machine this morning in your demonstration?

A. That is difficult for me to say, how much current, that is, the quantity, but the voltage was approximately $4\frac{1}{2}$ volts, according to the volt meter reading, which is on the open circuit, and those readings were taken at the time.

(Mr. Church: May I interrupt this examination of this witness in order to prove a book I brought from the Public Library? I should like to have counsel for the other side shorten the process by admitting a copy of the American Electrician of April 1901. It is in the Public Library. It is introduced for the purpose of showing a cut, and I will offer a photostat copy of that as soon as I can get it. I will ask Mr. McBerty a question about it.)

Q. 359. Please examine this copy of the American Electrician of April 1901 which has been brought in from the Public Library of Detroit, and state if you will what the two cuts on the lower right hand page 163 represent?

A. The cut on page 163 marked figure 34, represents the Peerless Desk Fan Motor, apparently one of our high grade or Type A fan motors.

Q. 360. How are the blades connected to the spider of that fan?

A. They are riveted on, three rivets per blade.

Q. 361. Do the rivets plainly show in that cut?

A. Very distinctly.

Q. 362. How about the other cut?

A. On figure 36 marked "Peerless Enclosed Field Fan Motor" the blades do not show any rivets or marks of any kind where they are attached to the center or hub.

Q. 363. How does that last cut referred to correspond with the cuts of the G-2 fans shown in the catalogs of 1901 and 1902 produced yesterday?

A. They compare very closely. I would say they were identical.

Q. 364. Will you read the text descriptive of those fans, if you can find it there on that page.

A. It is a part of a write-up, describing various fans being placed on the market in the spring of 1901. It says:

“The Warren Company”——

(I presume referring to the Warren Electric and Specialty Company)

“also builds a fan motor of the enclosed-field type in two forms, one of which is illustrated in figure 36. The machine illustrated is not adjustable on the pedestal, and runs at only one speed. The 12-inch 110-volt fan runs at 1650 r.p.m. and requires $\frac{1}{2}$ ampere. This fan is known as Type G. The same type of field magnet is used in an adjustable fan known as Type E, in which form the motor is mounted on trunnions for vertical adjustment, and has also a horizontal swivel adjustment. The Type E fan, moreover, has a rheostat and switch in the base, which gives it three running speeds, while the Type G machine has no speed adjustment.”

Q. 365. State, if you know, how these two fans came to be illustrated in this publication?

A. The practice in years gone by of the American Electrician was to get in touch with the manufacturers and illustrate and write up the new things they had to offer the public each spring in the line of fan motors, and this is the write-up of the fan motors being put on the market in the spring of 1901.

Q. 366. Was that a paid advertisement?

A. It was not.

Q. 367. How happened it to get into this book or publication?

A. This would be the result of a request from the American Electrician to the Warren Electric and Specialty Company to advise them and to supply them with cuts and information describing and illustrating their new production.

(Mr. Church: It is consented that a photostat copy of page 163 of the American Electrician of April, 1901, may be offered in evidence in place of the publication itself; the same to be marked Defendant's Exhibit No. 62.)

(The Court: Is this or is it not the same cut—I am referring to figure 36, page 163—that is used as fan G-2 in your catalog of 1901?)

(The Witness: As near as I can figure, it is the same cut.)

(McBerty's testimony continued, page 315.)

(Mr. Church: May it please your Honor, I should like personally to again look at the exhibits which were produced yesterday, if I may.)

(The Court: Certainly.) (handing exhibit to counsel.)

(Mr. Church: It is not necessary to show them to the witness, but I ask counsel to let me see those exhibits that are supposed to be connected with the affidavits.)

(Mr. Stackpole: Oh, yes.)

(Mr. Church: You have no objection to my bringing them over to the light?)

(Mr. Stackpole: Oh, no, no.)

(Recess to 1:30 P. M.)

AFTERNOON SESSION.

EDWARD B. CRAFT.

EDWARD B. CRAFT, after being duly sworn on behalf of the defendant, testified as follows:

Direct examination by MR. CHURCH:

Question 1. Please state your name, age, residence and occupation.

Answer. Edward B. Craft: 37 years old; assistant chief engineer of the Western Electric Company, New York.

Q. 2. Where is your home, Major Craft?

A. Afton, N. J.

Q. 3. How long have you been with the Western Electric Company?

A. Since January 6, 1902.

Q. 4. Will you give an idea of the number of engineers or the corps of engineers under you sir?

A. The number varies; there are a total of about 2,000 engineers in the department, about half of which report to me.

Q. 5. And the other half report to whom?

A. The second assistant chief engineer.

Q. 6. In what department do you preside, and over what department does he preside?

A. The work is divided about equally between the research department, which is in charge of the other gentleman, and engineering and designing under my charge, which is the development of experimental work in connection with the department of telephone apparatus.

Q. 7. You have been in the army, have you not, sir?

A. Yes, sir.

Q. 8. How recently have you returned from abroad?

A. I returned September 22nd.

Q. 9. What were your duties abroad?

A. I was employed during the last months by the Navy Department in connection with consulting work in the Radio Department.

Q. 10. Where were you born?

A. Born in Ohio.

Q. 11. Do you know F. P. McBerty, who has given testimony here today?

A. I do.

Q. 12. How long have you known him?

A. About 20 or 22 years.

Q. 13. Were you ever employed by the Warren Electric and Specialty Company of Warren, Ohio?

A. I was.

Q. 14. During what period did that employment cover?

A. At the time I was attending high school in Warren; I was employed during the summer vacations there and from 1898 until the first of 1902 I was employed regularly by that company.

Q. 15. And where did you go and gain employment after having left the Warren Electric and Specialty Company?

A. I left the Warren Electric and Specialty Company to go with the Western Electric Company at Chicago.

Q. 16. Have you been connected with the Western Electric Company ever since?

A. Ever since.

Q. 17. When were you transferred to New York?

A. In the fall of 1907.

Q. 18. Have you any knowledge of the use of an electric welding machine at the Warren Electric and Specialty Company?

A. I have, yes, sir.

Q. 19. During what period did you obtain that knowledge?

A. During the latter part of 1900 and during the year 1901.

Q. 20. Where did you gain your first experience of electric welding?

A. My first experience in connection with electric welding was brought about by a visit I made to the Pneumatic Wheel Company of Freehold, N. J., who had purchased of the Warren Electric and Specialty Company a welding transformer, a boosting transformer, being used by this company in the manufacture of a steel wheel, and through some controversy in connection with the operation of the boosting transformer, I was sent down there to ascertain what the trouble was, and at that time I saw them welding steel wheel arms by the electric butt process, and became familiar with their operation.

Q. 21. That was your first introduction to electric welding?

A. Yes, sir.

Q. 22. And that was butt welding?

A. Yes, sir.

Q. 23. State, if you know, how it came about that an electric welder was purchased at the factory of the Warren Electric and Specialty Company when you came back?

A. At that time, the latter part of 1900, Mr. McBerty and I practically constituted the technical staff of the Warren Electric and Specialty Company, and I told Mr. McBerty about what I had learned in regard to electric welding, and at that particular time we were engaged in the development of this form of fan motor, desk wheel type of fan motor, and we were going to use steel instead of brass wherever we could for such as fan guards, and fan blades, and it occurred to us there was a possibility of employing the butt welding process in the manufacture of these fans, and we proceeded to make up a rather crude form of a welding device and using it in welding up these parts.

Q. 24. What were the parts you designed to be welded by that machine?

A. Our first machine had to do with the employment of this machine in butt welding the rings which go to make up the assembly of the fan guard. Later on Mr. McBerty did some experimenting with the same machine in the spot welding of the fan blades to the hub of the fan wheel. I personally did not do any of that spot welding work.

Q. 25. What did you see, if anything, in the way of spot welded work done by Mr. McBerty?

A. Mr. McBerty showed me samples of the work he had done with this machine, and I remember of his particularly showing me one of these steel blades and spider and showing me how strong it was, and what a good substitute it was for the ordinary riveting process.

Q. 26. State whether or not that was a complete fan blade?

A. That particular one upon which he demonstrated the strength of construction was only a partially assembled fan. I saw others, however, which were completely assembled, the blades attached to the central spider.

Q. 27. How, if at all, were any of these fan blades tested for strength of union?

A. This sample I have previously described, the test for strength was made by attempting to pull the blade loose from the hub with a pair of pliers, and its strength was indicated by the fact the blade pulled loose from the hub and left a portion of the metal attached to the hub.

Q. 28. How many of these completed fans, spot welded, as you have described, did you see at that time?

A. I saw a number of them, I am not able to say how many, but several of the completed fans, and completed motors.

Q. 29. Were the fans attached as a part of the motor, or were they separated from it?

A. I saw them in an unassembled state and completely assembled.

Q. 30. Will you please describe as accurately as you may the appearance of these blades that were connected to the centers or spiders by welding? What did they look like?

A. The principal difference, the distinguishing difference between those fans and the ordinary standard output which had been used theretofore, and those fastened together by means of rivets was the fact there were no rivet heads on the surface of the fan blades. That is, these spiders, or centers as you have been referring to them, looked as though it was steel punching from sheet metal, the radial arms of the spider turned at a slight angle to the fan.

Q. 31. Do you recall whether those spiders had perforations in the arms?

A. I don't recall whether these particular ones that were welded had perforations in the arms or not.

Q. 32. Do you recall whether these fan blades you saw had perforations in them?

A. They did not.

Q. 33. They were plain?

A. They were plain, without perforations.

Q. 34. Do you recall how many weldings were made between each fan blade and each spider?

A. I can not recall the exact number; there were several, but how many, I would not attempt to say.

Q. 35. Whereabouts on the blades or the spiders were they placed with reference to the edges?

A. They were in the central portion of the blade, necessarily so, because the spider itself is narrow.

Q. 36. When did you say you left the Warren Electric and Specialty Company?

A. On January 4, 1902.

Q. 37. Are we to understand you never afterwards were employed by that company?

A. I was not.

Q. 38. Were you ever employed there afterwards, in Warren?

A. No, sir; I have only visited it once, as a matter of fact.

Q. 39. Do you recall what transformer was used in the construction of that welding machine used at Warren in 1901, as you say?

A. It was a transformer constructed there in the factory. At that time the Warren Electric and Specialty Company were also making a transformer and this particular one was designed and manufactured in the shop.

Q. 40. Did you have any part in the assembling or connecting up of this welding machine of which you have spoken?

A. Yes, I personally connected the thing up with the transformer and made the first weld with it.

Q. 41. And the welds you made were with the rings?

A. Yes, sir.

Q. 42. Do I understand that you yourself did not do any welding of the blades to the fans at that time?

A. I did not.

Q. 43. You understand what spot welding is?

A. I do.

Q. 44. Were the welds that you saw on the blades of these fans, that were completed, as you said, were they what you would call spot welds today?

A. Yes, sir, as I understand the term.

Q. 45. What is your notion of spot welds? I guess we had better get that.

A. My understanding of spot welds is that the two pieces of metal to be welded are joined together at a point by electric welding, surrounded by non-welded material.

Q. 46. How are those spots made?

A. By copper electrodes pressed on either side with a heavy current passing between them.

Q. 47. Were or were not any such electrodes used in that machine of Mr. McBerty's?

A. Yes, sir. There were pointed or rounded nosed copper electrodes.

Q. 48. Were you present at the Ford plant here today when Mr. McBerty did some welding on the welding machine in the presence of the Court, Judge Killits?

A. Yes, sir.

Q. 49. Did you recognize that machine as one you had before seen?

A. To all appearances, it was the identical machine that I wired up in Warren, Ohio.

Q. 50. Will you please examine this machine here in court and tell the Court if you can identify this machine?

(Witness leaves the stand and is shown Defendant's Exhibit B, McBerty machine.)

A. This is the machine that was assembled and wired at the time described.

Q. 51. What parts of this machine do you recognize as original?

A. I recognize the lower frame members and the movable arms attached to them which were designed to be brought together by means of cam levers; also, the clamping jaws or electrodes, they are really jaws here; attached to these were members which were also adapted to clamp the work to be welded by means of the cam levers. I recognize the transformer that is associated with it.

Q. 52. You saw Mr. McBerty do some welding at the Ford plant this morning, did you not?

A. I did, yes, sir.

Q. 53. What did you see him do?

A. I saw him do some spot welding of fan blades to the fan hubs on this machine, these blades and hubs being similar in appearance to those I saw in Warren.

Q. 54. Did you see him do any other kind of welding? If so, what?

A. I saw him weld together two sheets of metal, I think they were fan blades themselves.

Q. 55. Did you see him do any other kind of welding by means of that machine?

A. Yes, sir, the welding of the steel rings, similar to the type of ring that was employed in the fan guards in the early days.

Q. 56. Had you had experience in the use of that machine in the welding of fan guards by a butt welding process?

A. Yes, I have.

Q. 57. Have you any fault to find with the performance of that machine when operated by Mr. McBerty for the butt welding of those pieces he welded there?

A. You mean this morning?

Q. 58. This morning.

A. They did not appear to me to be satisfactory in that obviously the jaws or the ring was not the proper form to fit in the clamping jaws, and it interfered with their alinement of the joints. Furthermore, it appeared the current was not properly adjusted to produce the proper sort of weld in that particular piece.

Q. 59. Does it require a different current to butt weld from that which is employed in spot welding? If there is any, please state it.

A. Of course, the value of the potential and current required varies with the character of the work itself, the amount of surface to be welded, etc.

Q. 60. Have you any doubt whether you could employ that machine for either butt welding or spot welding?

A. No doubt whatever.

Q. 61. I understand that while you did not use this machine in 1901 for spot welding, you did personally use it for butt welding of wires?

A. Yes, sir, the very first construction was made with these steel rings and they were entirely satisfactory.

Cross-examination by MR. STACKPOLE:

X-Q. 62. What, if anything, did you have to do personally with the making of the transformer with that wheel company of New Jersey?

A. Nothing.

X-Q. 63. Do you know how many turns were in the primary?

A. I do not.

X-Q. 64. Do you know how many turns were in the secondary?

A. No.

X-Q. 65. Do you know what voltage it was intended to be used with?

A. I probably did at the time, but I don't recall now.

X-Q. 66. Was the transformer in the same condition when it came back to the Warren Electric & Specialty Company as it was when it left there?

A. You mean the transformer that was sold to this New Jersey company?

X-Q. 67. Yes, sir.

A. I don't know. I didn't see it when it came back.

X-Q. 68. You did not see it when it came back?

A. No. That was a commercial type of transformer.

X-Q. 69. One of the regular type?

A. No, it was made for this particular purpose, but it was a commercial transaction; it wasn't experimental.

X-Q. 70. Is the transformer of this machine the one that went to Freehold?

A. Oh, no, no. This transformer was made up after that transaction.

X-Q. 71. When was that?

A. That was the latter part of 1900. The experimental work was carried on the latter part of 1900, and early part of 1901.

X-Q. 72. Do you recall the transformer came back from Freehold?

A. No, I do not. It was to come back, because it was not used down there. That is, the booster transformer, not the welding transformer.

X-Q. 73. I am talking about the welding transformer. Did that come back from Freehold?

A. No, that was sold.

X-Q. 74. No transformer came back from Freehold?

A. Not that I know of.

X-Q. 75. When did you go to Freehold to see this machine?

A. I can not recall the exact date, but it was the latter part of 1900, either the fall or early winter of 1900.

X-Q. 76. How does this transformer differ from the one that was in Freehold?

A. It is considerably smaller, for one thing.

X-Q. 77. I mean by this transformer the one that is in the box here.

A. This one is much smaller than the one in Freehold.

X-Q. 78. You mean smaller in size or capacity?

A. Both.

X-Q. 79. What is the number of primary turns in the transformer of this present machine?

A. I don't know.

X-Q. 80. Do you know the number of secondary turns?

A. I do not.

X-Q. 81. Do you know the proper voltage to use with it?

A. I don't know. That is determined by experimnet.

X-Q. 82. Do you know what was the voltage used with this machine in the Warren Electric & Specialty Company's factory in welding the fan guard rings?

A. Which voltage do you mean, the primary or secondary?

X-Q. 83. The primary.

A. As I recall—I am not sure—it was about 250 volts. It was a low voltage primary.

X-Q. 84. Is that the same current that was used for lighting?

A. No, we had a special machine for that purpose.

X-Q. 85. Did they use the same current at that time that was used for lighting?

A. I don't think this same machine was used for lighting.

X-Q. 86. I mean, was the current used for lighting that was used for this machine?

A. I don't think the same current that was employed for welding was employed for lighting, although I am not sure.

X-Q. 87. Did you see or did you not see him do spot welding with this machine?

A. I did not see him do spot welding, no.

X-Q. 88. Was it employed regularly in spot welding?

A. Of my own knowledge, I don't know the extent to which this was employed, and my own personal knowledge only extends to the comparatively few samples that were shown me by Mr. McBerty, and my seeing the machine with the spot welding electrodes attached to it for this work.

X-Q. 89. You saw the machine this morning; did you notice the spot welding electrodes?

A. I did.

X-Q. 90. Were they identical with the ones used in 1901 that you saw?

A. They were identical in appearance; whether they are the identical electrodes, I could not say.

X-Q. 91. Did the electrodes used in 1901 have the shoulder on them that these electrodes had this morning?

A. That I could not say.

X-Q. 92. How many complete four-bladed fans and spiders did Mr. McBerty show you?

A. Well, I could not say exactly. I should imagine they were in the neighborhood of half a dozen, as I recall it. Several of them. I would not attempt to give the exact number.

X-Q. 93. No more than half a dozen?

A. I could not say that. That did not necessarily include all that was made, but the ones I saw.

X-Q. 94. I didn't understand whether you said you saw these assembled or complete fans or not?

A. Yes, sir, I saw them in an unassembled and assembled form, complete fans.

X-Q. 95. You didn't see Mr. McBerty do the spot welding of these fans?

A. No, I don't recall that I saw him exactly do the work.

X-Q. 96. Do you recall the means that were employed for separating the base plates of this spot welding device?

A. By base plates you mean the two stationary members to which the terminals are connected?

X-Q. 97. Yes.

A. As I recall it, they were insulated on the wooden bench by strips of fibre.

X-Q. 98. Was the fibre between the base plate and the bench?

A. As I recall it, yes, sir, to protect the wooden bench.

X-Q. 99. Was there any fibre between the plates themselves?

A. I would not attempt to say just exactly the detailed construction of that machine, but I do recall that wherever insulation was necessary to be employed, fibre was employed. I don't recall the exact detailed construction, it is 17 or 18 years ago.

X-Q. 100. Do you recall a visit made to you by Mr. Thomas Howe?

A. About what time was that?

X-Q. 101. About the year 1913.

A. I don't recall, not the name. I don't recall it. I would have to have something more definite, I think, to bring it back.

X-Q. 102. Mr. Howe is the gentleman here; do you recall him?

A. He visited me in connection with welding matters?

(Mr. Howe: Yes, sir.)

A. I have a very hazy recollection now of having a visit from somebody along about that time. In 1913 I was in New York.

X-Q. 103. At that time do you recall whether he questioned you about these matters that occurred in Warren back in 1901?

A. I have a very hazy recollection of it. It may come back to me now that it is mentioned, but I had entirely forgotten this. Let us see. In 1913. Somebody talked to me about this matter in 1913. Whether it was Mr. Howe or not, I can not recall.

X-Q. 104. Between 1901 and 1913 had any one talked to you?

A. No.

X-Q. 105. Mr. Howe, you think, talked to you perhaps in 1913; who else talked to you since about this?

A. Mr. Pattison has talked to me about it.

X-Q. 106. Mr. McBerty?

A. Mr. McBerty has written me, and he was in my office one day, too.

X-Q. 107. When did Mr. Pattison talk to you about it?

A. I don't recall the exact date. I don't even recall whether it was before or after the war. It is not many years ago. That is about as definite as I could state it.

X-Q. 108. Did you tell him the same thing you told Mr. Howe?

A. If I discussed, and I did discuss the welding proposition with him, I undoubtedly told him the same thing I did anybody else.

X-Q. 109. Did he show you the samples at the time he said Mr. McBerty had made?

A. Mr. Pattison?

X-Q. 110. Yes.

A. I don't recall that he did, no.

X-Q. 111. Did Mr. McBerty show you any samples?

A. No.

X-Q. 112. You discussed this with Mr. McBerty?

A. Yes, sir.

X-Q. 113. When was that?

A. It was, I think, probably nearer 1913 than the present date. I think it was in connection with the 1913 history of this war.

X-Q. 114. About the same time Mr. Howe came to see you?

A. Some time along about that time. I know this whole thing was in the air at that time.

X-Q. 115. And you gave what information you had up to Mr. McBerty?

A. Yes, sir.

X-Q. 116. And how recently have you gone over this with Mr. McBerty?

A. I have had no conversation with Mr. McBerty, other than a few casual words at the plant this morning. I had not seen him before.

X-Q. 117. Not since 1913?

A. No.

X-Q. 118. Did you give an affidavit to Mr. McBerty, or to Mr. Howe, or anybody in 1913?

A. I gave an affidavit at the request of Mr. McBerty's people, whether it was Mr. Howe, I don't recall, but I gave an affidavit.

X-Q. 119. Do you know who prepared that affidavit for you? Or did you prepare it yourself?

A. I prepared it myself, as I recall it. It may have been finally put in legal language by a lawyer, but I wrote the subject matter of it.

X-Q. 120. To whom was that affidavit given?

A. I think I sent that by mail to Mr. McBerty. I would have to refer to my own files for that. I know I received an acknowledgment from him in Warren.

X-Q. 121. What year was that in?

A. I can not tell you exactly, but as I say, as I recall it, it was in the period along 1913 or 1914 possibly. My best judgment is that was the date. I could check it up for you exactly, of course.

X-Q. 122. It went rather to Mr. McBerty than to Mr. Howe?

A. I am quite sure it went to Mr. McBerty. I know that I received a letter of acknowledgment from him.

X-Q. 123. Did Mr. McBerty write you concerning these matters which you testified about that occurred in 1901?

A. Yes, sir; yes, sir.

X-Q. 124. Have you those letters?

A. I have not them with me, no.

X-Q. 125. Can you produce them? Are you willing to send them to counsel or the Court?

A. I can produce such letters as I have in my office in New York, yes, sir.

X-Q. 126. I should like to have you do so.

(Mr. Fish: Be specific so that he will know what you mean.)

(Mr. Stackpole: I want the letters that you received from Mr. McBerty asking you about this welding machine used in 1901. Will you send to the clerk of this court all the letters from Mr. McBerty and your replies thereto, relating to the use of the 1901 welding machine used at the Warren Electric & Specialty Company's factory?)

A. Upon proper order, I will do that.

X-Q. 127. Upon proper order?

A. Yes, sir.

(Mr. Stackpole: Will your Honor ask the witness to do that?)

(The Court: I see no objection to that.)

(Mr. Church: None whatever; on condition, of course, they are made a part of the record when they come in.)

(The Court: Yes, of course, they must be made a part of the record.)

X-Q. 128. (By Mr. Stackpole.) Did you receive other letters from Mr. McBerty in a later year than 1913?

A. Not that I recall, no, but I would have to go through my files to be certain of that.

X-Q. 129. Did you receive any photographs from Mr. McBerty?

A. In connection with the initial affidavit they sent me photographs of this machine which I returned.

X-Q. 130. Did they send you any samples of the work done, any spot welding samples?

A. No.

X-Q. 131. Was the transformer that is now in the machine one of a lot of transformers that was the usual output of the Warren Electric & Specialty Company, or was it a special transformer?

A. As I recall it, this transformer was made up specially for this job. That is my recollection. I did not design the transformer myself.

X-Q. 132. Did you design the transformer that went to Freehold?

A. No.

X-Q. 133. And that transformer did not come back?

A. No, not to my knowledge, it did not; it was in operation when I last saw it in Freehold.

X-Q. 134. What was the trouble with the transformer that was used at Freehold, the welding transformer, I mean?

A. Nothing at all; it was entirely satisfactory.

X-Q. 135. Was there ever another transformer sent to Freehold?

A. Not a welding transformer. A boosting transformer was sent to the company.

X-Q. 136. What is a boosting transformer?

A. It is a transformer for either increasing or decreasing the voltage in the secondary side, which is the voltage regulating the transformer.

X-Q. 137. Isn't that the function of any transformer, to increase or decrease the voltage? I don't get the distinction that you make between a welding transformer and a boosting transformer.

A. This simply was employed to regulate; it might have been the primary voltage, I think it was, to regulate the primary voltage by means of steps of varying ratios. It was a regulating device, and was not used because the manufacturer found he could regulate from the alternating or direct.

X-Q. 138. So far you know, only one welding transformer was sent to the Freehold company?

A. Yes, sir, making that distinction between welding and boosting transformers, yes, sir.

X-Q. 139. How many boosting transformers were sent?

A. Only one.

X-Q. 140. And only one welding transformer?

A. Yes, sir.

X-Q. 141. They were together?

A. Yes, sir.

X-Q. 142. Neither of them came back?

A. No, sir.

X-Q. 143. And they were both satisfactory?

A. They were both satisfactory, except the manufacturer did not want to pay for the booster because he did not need it.

X-Q. 144. He did not send it back?

A. Not that I know of, no.

X-Q. 145. Do you know the number of turns in the primary of this transformer, of the machine you witnessed the operation of this morning?

A. No, I told you before I did not know the number of turns.

X-Q. 146. Do you know the voltage that was obtained across the terminals of the welding device this morning?

A. Yes, I observed $4\frac{1}{2}$ volts.

X-Q. 147. Is that the same voltage used with the Warren Electric & Specialty Company?

A. As I recall it, it ran between 4 and 6 volts, depending on what you are trying to do with it.

X-Q. 148. You said, I believe, that the voltage used this morning was too heavy for the butt welding.

A. I did not say it was too heavy; I did not think it was properly adjusted for that particular work. It may have been too heavy, or it may have been too light.

X-Q. 149. Would you say that was the same current that had been used for the butt welding on this machine in 1901?

A. That I don't know.

X-Q. 150. Do you know what would be a proper voltage with the size of wires that were used this morning on that machine?

A. No, I would not attempt to say that, either.

X-Q. 151. You don't know whether it would be only one, or five volts?

A. I should say it would be somewhere between those two figures.

X-Q. 152. You have referred to some fan blades that were spot welded to the spiders, how were the blades usually fastened to the spiders in this type of fan?

A. Rivets, the same as in the standard, the same as the standard fans made previous to that time.

X-Q. 153. And those fan blades were punched for rivet holes?

A. You are referring now to the regular type?

X-Q. 154. Yes, sir.

A. When they were riveted, they were punched.

X-Q. 155. Were they punched at the same time they were cut?

A. That, of course, I don't know.

X-Q. 156. Were the spiders punched at the same time they were cut?

A. That I could not say either. If I were to judge, I presume they were a separate operation. That kind of operation usually is separate, blanketing and perforating, as they call it, but I am not sure about this particular case.

X-Q. 157. How many of this type of fan were made in 1901?

A. That I could not say.

X-Q. 158. Were there several thousand?

A. I should judge so. I know there were large numbers being manufactured at that time.

X-Q. 159. Were there as many as three thousand, would you say?

A. That I would not attempt to say; I don't know.

X-Q. 160. Then there were, with the exception of those few that were spot welded, all the others riveted in the blades and spiders?

A. As I recall it, yes, sir. The standard method of practice.

X-Q. 161. That was the standard regular practice?

A. Yes, sir.

X-Q. 162. And the fan guard rings were butt welded?

A. Yes, sir.

X-Q. 163. Was the diameter of the wires of the fan guard rings the same as the diameter of the wire of the rings that you saw welded this morning?

A. I don't know as I can say definitely, but I recall that the actual fan guard rings were larger in diameter. It appeared the outside rings were 18 to 24 inches in diameter.

X-Q. 164. I am referring to the diameter of the wire itself.

A. The diameter of the spoke of the ring from which the ring was made, as I recall it, was heavier.

X-Q. 165. Were the front guards and back guards of the same weight?

A. I am not sure about that.

X-Q. 166. Was there any other transformer than this one used in the fan motor department at Warren?

A. Well, I don't know. I don't know whether a transformer was used there. I am not sure.

X-Q. 167. Was there any other operation that required a transformer of this character?

A. Not that I know of, but it would not necessarily follow there were no others, but not to my knowledge.

X-Q. 168. Was there in operation prior to that time such a transformer?

A. No. At that time, as I recall it, all the motors were direct current motors, and I don't recall of any alternating current being used in connection with the manufacture of the motors.

X-Q. 169. All the motors, you say, were direct current motors? What motors?

A. Motors that were being manufactured; although at that time if there had been an alternating current, they would have used them for testing.

X-Q. 170. In connection with this 1901 machine and the fan blades, and so forth, have you talked with anybody else besides Mr. Pattison, Mr. McBerty and Mr. Howe?

A. I talked with Mr. Church about my coming up here.

X-Q. 171. Did you talk with Mr. Smith?

A. Mr. Smith?

(Mr. Church: What Smith?)

X-Q. 172. A Mr. Smith.

A. Not that I recall.

X-Q. 173. When the transformer was in use, where was it located, with reference to the welding device?

A. As I recall it, it was on the floor underneath the bench to which the welding jaws were attached, right on the floor, underneath the bench.

X-Q. 174. And the welding device was attached to the bench?

A. Yes, sir.

X-Q. 175. And you recognize that board as part of the bench?

A. No, I could not say that was a part of the bench. It looks something like it, however.

X-Q. 176. Well, all benches look more or less alike.

A. Yes, sir, they do.

X-Q. 177. There are holes through these flanges of the bottom blades of this McBerty machine near their front ends. Do you recall that hole?

A. May I look at that? No, I don't remember that. It may have been there. I don't recall it.

X-Q. 178. Do you recall the width with which the two base plates were separated from one another?

A. Not exactly. They were not far apart.

X-Q. 179. Are they apart further now, or not so far apart?

A. I should think they were in the same order then as that shown here.

X-Q. 180. How near did you come to that? Did you come within $\frac{1}{8}$ inch?

A. I don't believe I could trust my memory to an $\frac{1}{8}$ of an inch.

X-Q. 181. You say you don't recall the fibres that are in there now?

A. I have not a picture in mind of exactly how the fibres looked, for that base; I don't know.

X-Q. 182. We have two pieces of red fibre and one gray fibre. Does that help your memory?

A. No, it may have been well changed a dozen times.

X-Q. 183. Do you recall the use of anything other than the electrodes that might have been used for spot welding?

A. No, no; that is the only thing I recall.

X-Q. 184. Do you recall any attempt to weld copper wires?

A. I don't recall. I can not bring to mind now a trial of that sort, although we did do almost all sorts of experimenting on that machine. We tried most everything.

X-Q. 185. Do you regard this matter of welding blades to spiders by spot welds as experimenting or not?

A. Yes, most distinctly experimenting.

X-Q. 186. And after they had made four or five of these blades, the operation was given up?

A. I understand that it was not adopted as the regular manufacturing process.

X-Q. 187. Do you know the reason why?

A. No, I don't. I was not connected with the actual manufacturing of the fan motors.

X-Q. 188. Did you know Mr. Gillmer at the time?

A. Yes, sir, very well.

X-Q. 189. What other experiments did Mr. McBerty make with that machine?

A. These were the only ones that I recall.

X-Q. 190. Would he do these experiments in the regular working time or during the lunch hour?

A. Oh, no, he did it in the regular working time. He was the superintendent at that time of the fan motor factory and that was part of his work. He was the principal part of the technical staff.

X-Q. 191. He did that in the regular time?

A. As I remember it. I don't remember any specific instance where it was done outside of hours. It was a part of our regular work.

X-Q. 192. Of course, the butt welding of the fan guard rings was regular work?

A. After it became a regular commercial operation.

X-Q. 193. Do you remember what time in the year that became a regular commercial operation?

A. No, I don't, but it must have been very early, because it was the custom to start the season's product very early in the year.

X-Q. 194. How early?

A. Of course, some parts are made all during the winter previous, and then we start assembling in the early spring, and anticipate the orders coming in.

X-Q. 195. They would not do any assembling until the spring?

A. Oh, not necessarily.

X-Q. 196. What do you mean by spring, March, February or April?

A. It all depends upon what part of the country they are going to, but the fan motor business, as I remember, became very active shortly after the first of the year.

X-Q. 197. You mean the manufacture of fans?

A. The production of fans.

X-Q. 198. Ready for the summer season?

A. Of course, the summer season varies with the geographical location.

X-Q. 199. Have you any means of identifying or recalling these spot welded blades and spiders, except your own memory?

A. No.

X-Q. 200. Purely unaided memory?

A. Yes, sir.

X-Q. 201. In welding the fan guard rings, what kind of clamping devices were employed on this machine? I refer to the movable copper clamps.

A. They were flat copper jaws curved, with a curved face, and also grooves to conform to the contour of the wire from which the ring was made, so as to clamp it over a considerable area of wire.

X-Q. 202. The machine is not equipped now with that form of clamps?

A. No, the particular jaws on that machine are not the ones that were used on the large rings.

X-Q. 203. Are the jaws on the machine now original parts?

A. I don't recognize the two top copper jaws, broad copper jaws.

X-Q. 204. The movable copper jaws?

A. No, the ones that I recall, the ring laid horizontal with the machine.

X-Q. 205. And this morning they welded the ring in a vertical position?

A. Yes, sir.

X-Q. 206. Do you recollect that operation?

A. This morning I did, but I didn't recall it previously.

X-Q. 207. The rings were not arranged vertically in the ordinary practice in 1901?

A. Not that I recall; it may have been the small rings were welded vertically, but the only thing I have a vivid recollection of is the large ring being welded in a horizontal position. That I recall very distinctly.

X-Q. 208. Do you recall whether in the actual manufacture of these fans, the blades would be all made at one time, stamped and punched?

A. You mean—

X-Q. 209. At that time, in 1901.

A. What do you mean by "at one time"?

X-Q. 210. Would they make a few one day, some the next day, or would they make the whole lot and finish them up?

A. I don't recall, I am sure.

X-Q. 211. Look at this McBerty machine here once more. Can you state whether the fan device projects over the table to the same extent now as it did in 1901?

A. It looks very much the same.

X-Q. 212. Can you be more definite about it than that?

A. I can not.

X-Q. 213. You can not say definitely whether the projection of the fan devices were the same now as then?

A. No, I could not say from looking at this that they are the same now as they were then.

Q. 214. Where did you see the spot welded blades and spiders?

A. In the factory of the Warren Electric and Specialty Company.

X-Q. 215. In the fan department room?

A. I think it was in the tool room. We had a machine shop where we made dies, and as I recall it, the first time I saw the actual parts was in this tool room.

X-Q. 216. He had some samples there. Is that it?

A. Yes, sir.

X-Q. 217. And showed them to you there?

A. Yes, sir, and later on I saw the other samples in the more completed state.

X-Q. 218. What do you mean by "more completed state"?

A. More completed, assembled fan motors to the wheel; the first time I saw it was the hub with one blade attached to it.

X-Q. 219. And the next time you saw it what was it?

A. I could not say exactly when I saw it the next time, but at subsequent times.

(The Court: You saw the complete fan?)

A. Yes, sir; they were operating the fans.

X-Q. 220. Where were they?

A. They were standing on the bench.

X-Q. 221. The complete fan?

A. Yes, sir, ready to ship, as well as parts not assembled.

(Mr. Stackpole: Do you remember any photographs taken of them?)

A. No, I don't.

X-Q. 222. Do you recollect the use of any jig or holding device for holding the blades with reference to the arms of the spider such as were used this morning?

A. No, sir.

X-Q. 223. Did you see all those assembled fans at the same time?

A. As I recall the assembled fans, there were a few of them setting on the bench, along with others of a similar type. I should say I did see them all at one time.

X-Q. 224. You mean half a dozen?

A. Something like that, half a dozen or more.

X-Q. 225. Did you see the spiders and blades not in assembled form, did you see them at the same time you saw the assembled fans?

A. No, that was before. You mean the completed fan wheel?

X-Q. 226. Yes.

A. No, that was before. I saw that in connection with my observation of the work which Mr. McBerty was doing, as he would show me what was going on, knowing my interest in those things.

X-Q. 227. Now, in those completed fans that had these spot welded blades and spiders, were the rivet holes punched in either the spider or the blades?

A. You could not see them. I am not sure there were rivet holes in the spiders. You could not see them in the front.

X-Q. 228. You only saw the front?

A. I only saw the front; there were no rivets in the blades.

X-Q. 229. And they were covered with enamel?

A. They were japanned.

X-Q. 230. Suppose the rivet heads were countersunk and then japanned. Do you think you would have seen them?

A. Probably under those circumstances—

X-Q. 231. No. Answer that question.

A. I would probably have seen them if they had not been covered sufficiently.

X-Q. 232. If they had been japanned sufficiently you would not have seen them?

A. No.

X-Q. 233. So that of your own knowledge, do you know whether those fan blades were spot welded, with those spiders? Did you see the work done?

A. I did not see the work done; therefore, to that extent, it was not of my own knowledge.

X-Q. 233. So it is an inference on your part that they were spot welded?

A. To a certain extent, yes, sir.

X-Q. 234. Mr. McBerty showed you a certain number of the four bladed pieces with the fan blades connected to the spiders.

A. Yes, sir, I saw some of those assembled in various stages of completion.

X-Q. 235. Were the rivet holes in the spiders?

A. That I don't recall.

X-Q. 236. Were the rivet holes in the blades?

A. I am sure they were not.

X-Q. 237. If the rivet holes had been in the spiders or blades of the completed japanned fans that you say you have reference to, would the others have been visible?

A. I certainly would have recalled them. They would have been visible if they were there.

(The Court: In both blade and spider?)

(The Witness: Yes, sir.)

X-Q. 238. (By Mr. Stackpole) And you saw no rivet holes at all?

A. I did not see any rivet holes, but that does not mean they might not have been present in the spider and covered up by the blade.

X-Q. 239. You only saw the front side?

A. I simply looked at them as a finished thing, representing a new type of fan.

X-Q. 240. And that was showed you by Mr. McBerty?

A. Yes, sir.

X-Q. 241. And that was some time subsequent to the time he showed you these unassembled fan blades and spiders?

A. Yes, sir. He was just following the progress of his development work.

X-Q. 242. Can you remember what time in the year 1901 you saw these assembled fans?

A. No, I could not state accurately the date.

X-Q. 243. You think it was after, say, the first of March?

A. No, I should say it was probably before the first of March or shortly after. About April I was transferred from the work I was doing into the lamp factory of the organization, and my connection with this so-called engineering work so that it must have been some one of the first two or three months of the year.

X-Q. 244. This morning you saw a welded fan blade and spider; do you recall whether or not the fan blade and spider which you say you saw spot welded in 1901 were of this size?

A. As I recall, it was about that same size.

X-Q. 245. About a 12-inch fan?

A. I guess that is what it is, 10 or 12 inches.

X-Q. 246. It was similar in dimensions to that?

A. Yes, sir.

X-Q. 247. So that there is quite a marked difference between those and a 16-inch fan?

A. Yes, sir, that is the small size, as I understand.

X-Q. 248. When was the transformer of these particular machines built?

A. It was built some time after my return from the Freehold trip. It was built in connection with the development of this particular machine, but the exact date it was started I could not say.

X-Q. 249. Did you assist in designing it?

A. No, I simply gave the requirements, what the requirements would be.

X-Q. 250. What were those requirements?

A. We knew it would make a low voltage. It was rather a cut and dried proposition.

X-Q. 251. You tried first the welding of fan guard rings?

A. Yes, sir, I tried it myself personally.

X-Q. 252. Did you try welding any members than guard rings?

A. I don't recall it. We might have tried it, but probably were not very successful.

X-Q. 253. What do you mean by saying you might have tried it? Do you recollect trying it?

A. No, I don't recall trying it.

X-Q. 254. Do you recall Mr. McBerty trying it?

A. No.

X-Q. 255. In the letters which Mr. McBerty sent you, were there any photographs of those machines taken? I forget whether I asked you that before or not.

A. Yes, sir, there were photographs of the old machine, the original machine.

X-Q. 256. Did they show any fan blades or jaws, or anything of that sort?

A. Not that I recall. I returned the photographs and do not recall what they showed.

X-Q. 257. In those letters did Mr. McBerty describe what he did?

A. Yes, sir.

X-Q. 258. That is all.

(Mr. Church: One question:)

Re-D. Q. 259. Did your duties at the Warren Electric and Specialty Company require you to have anything to do with the shipping out or shipping in of transformers?

A. No.

Re-D. Q. 260. You were not connected at all with the shipping department?

A. No.

(Mr. Fish: This witness has testified he prepared an affidavit and sent it to Mr. McBerty. If the defendants have that affidavit, we would like to have it produced in court—the affidavit of Mr. Craft as stated in his testimony.)

(Mr. Church: May I ask you upon what ground you desire this affidavit?)

(Mr. Fish: Have you any affidavits?)

(Mr. Church: Yes.)

(Mr. Fish: He testified about an affidavit. We would like to see it if it relates to the subject matter of this controversy, the affidavit sent by the witness to Mr. McBerty.)

(Mr. Stackpole: We might like to cross-examine further when we have this affidavit which they have, and which we never heard of before.)

(The Court: Yes, I assume you would.)

(Mr. Church: This is a copy of the affidavit that we have.) (Referring to paper in his hand.)

(The Court: That is not the original?)

(Mr. Church: That is not the original. It is a copy. Will you accept that? I can not do better.)

(Mr. Stackpole: Do you know where the original is?)

(Mr. Church: I do not know where the original is. This is a copy handed us by Mr. McBerty.)

(Mr. Fish: What is the date of that letter?)

(Mr. Church: May 19, 1917, the affidavit he says he made was in 1913. I haven't got a copy of it; I will inquire. If there is such a copy, we will be glad to produce it.)

(Mr. Fish: We are not interested in the affidavit of 1917. We are interested in the affidavit of 1913.)

(The Court: Yes, that is the only one we are talking about.)

(Mr. Church: If there is such a one, I will inquire and produce it.)

Re-D. Q. 261. (By Mr. Church) Mr. Craft, I show you a copy of an affidavit executed in May 1917. Will you please examine it and state if you recall making an affidavit such as that, and sending it to Mr. McBerty?

(Mr. Stackpole: I object to that.)

(The Court: It is possible that is the one the witness has in mind.)

(Mr. Fish: He testified it was in 1912.)

(The Witness: Let me read it.) (Reading.)

(The Court: I noticed when he testified he gave the date of the other affidavit as before the Boston suit.)

(The Witness: I want to say I was hazy about the date of this affidavit at the time, and this is the only one I have ever made.)

(Mr. Church: That answers my question.)

(The Witness: This is the affidavit I have in mind.)

(Mr. Church: Copy of the affidavit referred to by the witness is offered in evidence as Defendant's Exhibit X.)

(Mr. Stackpole: And it is objected to.)

(The Court: You don't wish it in?)

(Mr. Church: Then I withdraw it.)

(Mr. Stackpole: The affidavit of 1913 is the one I want to see.)

(The Witness: That was my mistake.)

(Mr. Stackpole: May I ask one question?)

(The Court: Yes, relative to this affidavit.)

(Mr. Stackpole: Relative to the whole subject.)

(Mr. Church: Well, no, not unless you call him as your witness.)

(The Court: What is the controversy?)

(Mr. Stackpole: I want to ask him one or two questions, because that is a subject)—

(Mr. Church: I put this witness on for one purpose.)

(Mr. Fish: We have a right to ask your Honor to allow him to be recalled for further cross-examination.)

(The Court: Yes.)

(Mr. Church: I will not stand upon that matter. I think it will take care of itself.)

Examined by MR. STACKPOLE:

Re-X. Q. 262. When Mr. Howe called upon you in 1913, do you recall stating to him that you did not then recall any spot welded articles made in 1901 at the Warren Electric and Specialty Company?

A. I told him I was hazy about this spot welding, and I did not feel as I remembered it then that I could possibly state about the spot welding end of it. I did tell him that at that time.

Re-X. Q. 263. Since then, your recollection has been refreshed by conversations with Mr. McBerty?

A. Yes, sir.

Re-X. Q. 264. And at that time you refused to make any positive statement, because you could not recall any? Is that true?

A. Yes, sir, I was not absolutely sure. I had forgotten the whole circumstances for several years, of course.

Re-X. Q. 265. And refused to make an affidavit because you could not give Mr. Howe definite information?

A. I do not recall that I was then asked to make an affidavit.

Re-X. Q. 266. Since then, your recollection has been refreshed by conversations with Mr. McBerty?

A. Yes, sir.

Re-X. Q. 267. And specimens shown you?

A. No.

Re-X. Q. 268. Didn't you see the operation of the machine to-day?

A. Yes, sir.

Re-X. Q. 269. And by talking with Mr. Pattison?

A. Yes, sir.

Re-X. Q. 270. And talking with Mr. Church?

A. Yes, sir.

Re-X. Q. 271. And with anybody else?

A. No.

Re-X. Q. 272. And in 1913 you had forgotten the whole thing?

A. No.

Re-X. Q. 273. Didn't you tell that to Mr. Howe?

A. No, I didn't.

Re-X. Q. 274. What did you tell him?

A. I told him what I recalled relative to this welding proposition. I told him I was not sufficiently sure of my knowledge as to the details of this spot welding business to give him a definite statement, but I did recall the machine and described the machine to him, and what use I put it to.

Re-X. Q. 275. That is, butt welding?

A. Yes, sir.

Re-X. Q. 276. You didn't recall the details of the spot welding?

Re-X. Q. 277. As you have testified to today?

A. I did not.

Re-X. Q. 278. At that time did you tell Mr. Howe you saw these spot welded articles?

A. I can not recall whether I did or not.

Re-X. Q. 279. Didn't he ask you that?

A. I don't recall.

Re-X. Q. 280. Didn't he ask you that?

A. My whole recollection of Mr. Howe's visit is rather hazy at this time. He came in and asked me what I knew about this welding business and I talked to him, as I remember it, fifteen or twenty minutes.

Re-X. Q. 281. Did he ask you if you had seen any completed spot welded fans? I mean completed with the fan blades spot welded to the spiders.

A. I don't recollect that he did. He might have, but I don't recall it.

Re-X. Q. 282. If he had done that, do you recall any answer you made to him?

A. No.

Re-X. Q. 283. Did Mr. Howe show you any samples?

A. Not that I remember, no.

Re-X. Q. 284. You have seen no samples since 1901?

A. No.

(Mr. Church: May it please the Court: Some questions were asked the witness McBerty yesterday and were objected

to and I should like, if I may, ask the witness some further questions concerning the same line of examination, but before I do so, I should like to make a statement to the Court as to what I propose to prove. Now, it appears in the records and proceedings in this case that in the Bill of Complaint there is set up the former adjudication of the Harmatta patent in suit by the United States Circuit Court of Appeals for the First Circuit, in the case of the Thomson Electric Welding Company and the Universal Electric Welding Company, Plaintiffs, against Barney & Berry, Inc., as establishing the validity of this Harmatta patent in suit; that the plaintiff herein has offered in evidence a copy of the decree in said former suit, dated July 17, 1916, and is printed in plaintiff's record, volume I, page 17. That in the Answer in this suit it appears that the use, the prior use, of F. P. McBerty, the witness on the stand, and the prior public use of the alleged invention of the Harmatta patent by the Warren Electric and Specialty Company of Warren, Ohio are set up as defenses. That the witness McBerty has already offered testimony tending to show that before the trial of the Barney & Berry suit he had completed and put into use what is claimed to be the invention covered by the Harmatta patent, prior to the claimed date of of the Harmatta invention; and that the Warren Electric and Specialty Company had also put into public use the said invention of Harmatta for more than two years prior to the application of the patent.)

(That the witness McBerty has also offered testimony in this case tending to show that the facts concerning the prior use and prior public use by him and by the Warren Electric and Specialty Company in 1901 of the alleged invention of the Harmatta patent were communicated by him to the plaintiff and to plaintiff's counsel, and the defendant and defendant's counsel in the said Barney & Berry suit prior to the trial of that suit.)

(That the witness McBerty has already testified in that case that he was present in court throughout the trial of the Barney & Berry suit and was called as a witness for the defendant and testified for defendant in that suit, but was prevented, under objection of counsel for the plaintiff in that suit, from testifying to said use and public use by him and by the Warren Electric and Specialty Company of the alleged invention of the Harmatta patent, because of the failure to plead said defenses, in the Defendant's Answer in the former suit.)

(That it further appears from the testimony of McBerty herein, and is admitted by counsel for the plaintiff herein that the Barney & Berry suit was brought for the alleged use by the defendant in that suit of a spot welding machine furnished by the Toledo Electric Welder Company, and that the Toledo

Electric Welder Company undertook to defend and did defend that suit of Barney & Berry, Inc.; Barney & Berry, Inc., being only a nominal defendant in that suit.)

(It further appears from the testimony of the witness McBerty already given herein, that Frank Warren, the secretary and general manager of the Toledo Electric Welder Company, was also present at and throughout the trial of the Barney & Berry suit. That as tending to prove collusion, between the plaintiffs and the real defendant, the Toledo Electric Welder Company, in the Barney & Berry suit, or at least, as tending to prove the suppression by the real defendant, the Toledo Electric Welder Company therein of the defenses of prior public use founded on the McBerty work of 1901, defendant herein has offered to prove and has attempted to prove by the witness McBerty that during the progress of the trial of the said Barney & Berry suit that said Frank Warren, secretary and general manager of the Toledo Electric Welder Company, declared to the said witness McBerty that prior to and during the progress of said trial the said Warren, acting for and on behalf of the Toledo Electric Welder Company, was in negotiation with the Thomson Electric Welding Company, one of the plaintiffs in that suit, and with the Universal Electric Welding Company, the other plaintiff, in that suit, for the compromise and settlement of their differences, and for the making of a nominal or partial defense to said suit. It is further offered to prove by the said witness McBerty that after the decree in said Barney & Berry suit entered July 17th, 1916, to wit: on or about the 22nd day of November, 1916, an agreement was entered into by and between the Thomson Electric Welding Company, and the Toledo Electric Welder Company acting through the said Frank Warren, its secretary and general manager, and under and in pursuance of a formal resolution of the officers and stockholders of the Toledo Electric Welder Company whereby the said Toledo Electric Welder Company acknowledged and agreed not to deny the validity of the said Harmatta patent, acknowledged said Toledo Company had defended and was the real defendant of the Barney & Berry suit, and agreed it would not engage in the electric welding business in the United States or Canada for a period of ten years thereafter.)

(It is further offered to prove by the witness McBerty that on the 22nd day of November, 1916, at the time of the agreement last mentioned, the said Frank Warren entered into a contract with the Thomson Electric Welding Company under which it was agreed that the said Warren was to enter the employment of said Thomson Electric Welding Company and receive a salary of \$7,500 per annum for three years from January 1st, 1917, for his services, and was to receive as additional compensation a percentage of all the sums received by

the Thomson Company or any subsidiary company engaged in the business of selling said welding machines, of which it owned a majority of the stock, to wit: 15% of the first \$50,000, 10% of the second \$50,000 and 5% on all additional amounts so received that year.)

(Now, that is the situation, may it please your Honor, we desire to prove here, and it seems to me that it will have some bearing, if permitted to prove this, upon the weight that is to be given the adjudication of the Circuit Court of Appeals for the First Circuit, and upon that ground I ask leave to interrogate further Mr. McBerty and to prove the facts which we are ready to prove.)

(The Court: The exact question on which the Court ruled yesterday was whether Mr. McBerty could relate a conversation on this general subject between him and Mr. Warren. The objection was made that Mr. Warren was dead, and his testimony ought not to be received on that ground. That did not occur to me to be a valid objection. The ruling was based on the general proposition that the testimony was secondary, and was not a matter to which it could be said that the plaintiff was a party. I reviewed the matter after I left the Bench yesterday, and while I am not, as to that particular feature, altogether satisfied, that I have reached the proper conclusion, I have decided to admit the renewal of the offer to prove. This is largely, not altogether, but largely influenced by the admission made in court by the counsel for the plaintiff, that part of the purchase of the Toledo Company's interest, these evidences of alleged prior use which, of course, must occur to all of us to be of some significance at least, had been negotiated for and had passed into the possession of the plaintiff.)

(Mr. Fish: Your Honor is stating the exact admission?)

(The Court: I am not stating the exact admission. I am stating the impression)—

(Mr. Fish: There was nothing negotiated for except the purchase of the property.)

(The Court: Somebody said in settling the controversy that the Toledo Company, the plaintiff had acquired these exhibits and affidavits.)

(Mr. Fish: All the property of the Toledo Company came to the plaintiff, and these affidavits came with the rest of the property of the company.)

(The Court: I am in error in saying there was a special negotiation. I can see, too, another theory upon which it seems to me the defendant can urge why this testimony should go into this record. I am not prepared to say the theory is one I would hold on further consideration, but I can see the arguing point that has been suggested. I think I will permit you to put this testimony in over the objection of the plaintiff, and when it is all in, there will be an opportunity to determine whether it is competent or not.)

(Mr. Fish: I should like to say now, in view of this discussion on this subject, that, of course, objections will be made, and specific objections as it comes in.)

(The Court: Let us have it all go in under your objection. I think perhaps I ought to beg your pardon, Mr. Fish, in permitting you to let Mr. Church's proposition in with the objection. I assumed you would object. Mr. Church was not permitted to argue it; I took the matter away from him by proceeding to consider it. I did it solely in the interest of saving time.)

(Mr. Fish: How there can be any materiality or relevancy to such testimony as has been suggested, I certainly fail to see.)

(The Court: Certainly, some that has been suggested here would be immaterial. The fact Mr. Warren immediately became an employee of the Thomson Company, under the circumstances, I think the Court ought to hear.)

(Mr. Fish: He became such employee after the decision of the Circuit Court of Appeals.)

(The Court: The negotiations between the Toledo Company and the Thomson Company of the character suggested, I think, would be material.)

(Mr. Fish: I don't think Mr. McBerty can prove those negotiations by saying what Mr. Warren told him under any circumstances.)

(The Court: I don't think so either, as far as that is concerned.)

(Mr. Fish: That is as far as the suggestion goes.)

(The Court: I think I will let Mr. Church take the testimony.)

(Mr. Fish: We shall object generally and ask that exceptions be reserved.)

(The Court: Yes.)

F. P. McBERTY, recalled on behalf of the defendant, testified as follows:

Examined by MR. CHURCH:

Q. 368. Mr. McBerty, during the progress of the trial in Massachusetts in the Barney & Berry case, you were in frequent conference, were you not, with Mr. Frank Warren of the Toledo Electric Welder Company?

A. I was.

(Mr. Stackpole: We object.)

(The Court: Yes. The question and answer go in under objection and exception.)

(Mr. Fish: I should like to be allowed to call special attention to certain objections.)

(The Court: Oh, certainly.)

(Mr. Fish: Of course, the understanding is that the objection applies generally to all this line of testimony.)

(The Court: Yes.)

(Question read.)

A. I was.

Q. 369. Will you please state to the Court what developed, what declarations Mr. Frank Warren made on that occasion in regard to his efforts to settle the controversy while it was still in court and in regard to his making a partial or nominal defense in that case?

(Mr. Fish: I would like to have your Honor revise your ruling as to that question.)

(The Court: You may answer the question. You have the exception.)

A. I should like to read an extract from a letter written very shortly after that, because it will give a better idea than I can quote from memory.

Q. 370. You may refresh your recollection from that letter. To whom was that letter written?

A. This letter was written to the attorney of the National Electric Welder Company, J. Nota McGill, dated April 19, 1914.

Q. 371. Will you please read the letter? By whom was it written?

A. It was written by myself.

(Mr. Fish: He is reading a letter instead of testifying as to what Mr. Warren said. The question asked him was to testify what Mr. Warren said.)

(The Court: Do you object to his using the letter to refresh his memory?

(Mr. Fish: I suppose he has a right to refresh his recollection but it would be well to answer the question.)

(The Court: Yes, he can refresh his recollection, but not read the letter into the record.)

A. This case was decided against Barney & Berry, suit being instituted by the Thomson Company for infringement of the Har-matta patent, and defended by the Toledo Company. I was sent for by telegram the last day of March, 1914, requesting that I appear at Boston the next morning, prepared to give such information as I could. And after I had been there a couple of days, Mr. Warren became confidential and told me he had been down to Franklin to see the Universal people—

(The Court: They were co-complainants?)

A. As I understand, they were. I think he had been down there about three weeks, and his efforts were directed to getting together with the Universal, the Thomson Company and his own company, under some working arrangement whereby the Har-matta patent could be sustained and they all get a share of the royalties acquired in that manner. He also told me the case had been postponed one week to permit them to get this settlement arranged somehow, which gave me the impression that the Thomson Company were interested in having such a settlement made.

(Mr. Fish: That is objected to. This is a very gross injustice, to have this sort of gossip in the case.)

(The Court: That goes out.)

Q. 372. State what he told you, not your impressions.

A. He told me that the day before, which would be the last day

of March, he had a contract already written out and signed by Mr. Lachman of the Universal Company, which was based on the not making void of the Harmatta patent, and then the patent would be sustained and the Toledo Company would place their machines on a rental basis and the portion of the rental so acquired would be divided between the Thomson Company, a portion; to the Toledo Company a portion; and to the Universal Company a portion. They outlined all the terms to me. This was entirely satisfactory to the Universal Company and was signed by Mr. Lachman. When he went to the Thomson Company at Lynn, Mass., things were satisfactory to them, but there was one significant fact concerning this arrangement at this time, the deal being entirely between the Toledo Company and the Universal Company. When he returned to Boston to be present at the case to be tried, he found the Universal people were not going to be in the position he anticipated, and somebody told him Mr. Lachman had no authority to bind his company to such sort of contract. The result was he was compelled to go to trial, or his attorneys were compelled to go ahead with the trial.

(Mr. Fish: Are you now stating what Mr. Warren told you?)

(The Witness: I am now stating what Mr. Warren told me, and they were not prepared, on account of their hurried call to me to come down and furnish such testimony as I could. Mr. Warren told me if they did not get together with a settlement, he was going to clean up all his outstanding indebtedness, dispose of his interest in the business, and go out of the business, that he would not fight it any more. If there was any further fighting to do, the users of the electric welding machines would have to do it.)

Q. 373. Have you finished?

A. That is all, I think, that has any bearing on that particular end of it.

Q. 374. Did you at any subsequent time learn from Mr. Warren what arrangement had been effected with the Thomson Company and the Universal Company?

(Mr. Fish: The same objection and exception.)

(The Court: Overruled. Proceed.)

(Question read.)

A. That, I understand, refers to the Thomson, the Universal and the Toledo?

Q. 375. Yes.

A. Mr. Warren told me that he had a contract with the Thomson Company whereby he was to be retained under a specified sal-

ary, a percentage of the money collected as royalty under the Harmatta patent, on Toledo machines then in operation. This was given to me at Toledo, Ohio, when there was a meeting called of the spot welder manufacturers with a view of getting them all to operate under the Harmatta patent; Mr. Warren being appointed to line them up for that purpose.

(McBerty's testimony continued, page 331.)

(Mr. Church: May it please your Honor, I have here in print a copy of the contracts that were made between the Thomson Electric Welding Company, the Universal Electric Welding Company and the Toledo Electric Welder Company in regard to this subject; also, the contract that was made between the Thomson Electric Welding Company and Mr. Warren for his employment. There are present in court the president of the Thomson Electric Welding Company and the vice-president and the secretary, and if Mr. Fish requires me to prove this document by calling those gentlemen, I will do so, or he may admit it. I will submit it to the Court; it is in print, printed by the Thomson Electric Welding Company.)

(Mr. Fish: From what point of view are the contracts of these various welding companies admissible at this stage of the case, or for any purpose conceivable? I suppose your Honor will let it in in accordance with the theory you have let this general discussion into the case, but the other contracts are entirely irrelevant from any point of view.)

(The Court: I have read the record in the Massachusetts case, so far as it appears in this volume, and confess I can not see how anybody could arise from the reading of that record without a feeling—well, say of bewilderment, as to how this thing came about. I have read Judge Putnam's opinion over two or three times. I really don't get much out of it. I find in reading Judge Dodge sends it back. I do not mean to be understood as saying that I find anything in this record has a sinister cast to it, of course, not, but it does seem there is some significance in the fact, if it is a fact as stated by Mr. Church, that immediately after the perfunctory decree of Judge Dodge was entered, or shortly after it was entered)—

(Mr. Church: Five months.)

(The Court: The contest was settled in this way. If this were a real contest, a real victory, it seems to me there would be no special reason why the complainant should buy out the defendant.)

(Mr. Fish: May it please the Court, it was a very profitable transaction for the plaintiff; however, I suppose that is

not open for argument now. They made most favorable contracts, far better than any attempt at monopolizing)—

(The Court: Oh, the Toledo people had made contracts for its product obtained in that way? Is that what you mean?)

(Mr. Fish: No. We came in contact with all these companies and their business became our business, and they gave us a large share which became very large indeed. They took us practically into partnership; that is what they did, working on the line of least resistance much more than we could make by enforcing the monopoly.)

(The Court: Was there a reference after Judge Dodge's interlocutory decree taken? Was there a reference to a master?)

(Mr. Church: Oh, no; that was wiped out.)

(Mr. Fish: The real defendant was not in court; the whole thing was settled.)

(Mr. Church: They said they were going out to sue this Toledo company in Ohio.)

(Mr. Fish: Of course. It was a complete settlement with the manufacturers.)

(The Court: I think this is competent. I will hear it. Do you want Mr. McBerty on the stand any more?)

(Mr. Fish: No.)

(Mr. Church: If the contracts are not admitted, I will call Mr. Farley on the stand.)

(I will read a list of them:)

"Option;
Agreement to Sell;
Bill of Sale;
Toledo Guaranty to Thomson Company;
Authority to Mr. Frank Warren to Sell from all Stockholders of Toledo Company;
Assent to Sale on behalf of all Stockholders of Toledo Company;
Agreement by Thomson Company to Purchase Certain Machines from Toledo Company under Certain Conditions;
Personal Undertaking by Stockholders of Toledo Company not to Compete;

Employment of Mr. Frank Warren by Thomson Company;
Extract from Minutes of Special Meeting of Stockholders of
Thomson Electric Welding Company held November 17,
1916;

Extract from Minutes of Special Meeting of Stockholders of
Thomson Electric Welding Company held December 20,
1916;

Minutes of Stockholders' Meeting, Toledo Company;
Agreement relative to Cash on Hand."

(I think they might be admitted without taking the time to
prove them by one of the officers.)

(Mr. Fish: I think you had better put Mr. Farley on the
stand.)

(The Court: Did he sign these contracts?)

(Mr. Church: Certainly; here they are.)

(Mr. Fish: I think if you will put Mr. Farley on the stand,
we will cross-examine and ask him some questions with refer-
ence to them.)

JOHN W. FARLEY.

JOHN W. FARLEY, after being duly sworn on behalf of the de-
fendant, testified as follows:

Direct examination by MR. CHURCH:

Question 1. Please state your name, age, residence and occupa-
tion.

Answer. John W. Farley; 84 State Street; lawyer primarily.

Q. 2. Are you an officer of the plaintiff in this case?

A. I am.

Q. 3. What is your office?

A. President.

Q. 4. You were an officer, were you not of the Thomson Elec-
tric Welding Company?

A. I think so; I am not sure just how the changes came around.
Yes, I was.

Q. 5. And you were the president of that company, were you
not, in November, 1916?

A. Yes, sir.

Q. 6. I hold in my hand a pamphlet containing a list of transac-
tions, containing a series of transactions, the index of which I have
just read in your hearing. You heard me read it, did you not?

A. I heard a noise; I did not hear your articulation.

Q. 7. Will you please examine the pamphlet I now show you and state whether or not the originals of the documents that are therein contained are not in the possession of your company?

A. I assume so. I am thoroughly familiar with this.

Q. 8. This was a pamphlet put out by your company for the use of its officers and stockholders was it not?

A. I can not say as to that. It was printed with my knowledge. I don't know whether it was for the files or what the purpose was.

Q. 9. So far as you know and believe, that is a correct copy of those various documents, is it not?

A. You will appreciate, I am sure, that I will have to read them. There is only one with which I am thoroughly familiar.

Q. 10. And you doubt not, barring perhaps the transcriber's mistakes, it represents a correct copy of all those documents?

A. As to the ones I am familiar with; I can not tell you any more than my impression by looking at those. I have no reason to doubt it.

(The Court: It was intended to be so when printed, was it not?)

A. Oh, absolutely so. I only say I can not state of my own knowledge. I have not the slightest doubt about it.

Q. 11. Are there many of those documents in circulation?

A. I haven't any idea. We had quite a number of them printed.

(Mr. Church: I offer this pamphlet in evidence as Defendant's Exhibit 62. You may cross-examine, Mr. Fish.)

(The Witness: Some of these I know nothing about; some I think, with the Toledo Company, which I never saw, and know nothing about.)

Q. 12. (By Mr. Church.) But you think that represents a true copy of transactions that are therein related?

A. Yes, sir.

Cross-examination by Mr. FISH:

X-Q. 13. When did you become connected with the Thomson Electric Welding Company, as nearly as you can state?

A. Early in 1916.

X-Q. 14. What knowledge had you of the company at the time of the decision of the First Circuit Court of Appeals—when was that, Mr. Stackpole?

(The Court: October 5, 1915.)

(The Witness: I had never heard of the company until about three or four weeks prior to that time.)

X-Q. 15. And at that time how did it happen that you became connected with the company?

A. That will require a rather lengthy answer, sir.

X-Q. 16. I do not see why it should be very lengthy, but I suppose we have to have it.

A. My senior partner, Mr. Herrick, had acquired some stock in the company; he was going south, and gave me a proxy; that is the first I had heard of the company. I inquired about it and ascertained its general situation and ultimately went—I think Mr. Lyne was sent to the first stockholders' meeting, which was the annual meeting, and it was adjourned. Shortly thereafter, I went down myself.

X-Q. 17. When you say "down" you mean?

A. To Lynn, Mass.; where the annual meeting was held, and it appears that I with several others had a majority of the stock so that a Board of Directors somewhat different from the prior board was thereupon elected, I among others. The Board of Directors met shortly thereafter; they may have met immediately thereafter, but I am not sure of that. And after some formal and informal discussion, it was decided I should be elected president, which I was.

X-Q. 18. What was what date?

A. Well, I am not certain; my impression is it was about the middle of March, 1916.

X-Q. 19. The middle of March?

A. Yes, sir.

X-Q. 20. And at that time you and the Board of Directors directed the policy of the company?

A. From that time.

X-Q. 21. Before that, you had nothing to do with it?

A. Absolutely nothing, sir.

X-Q. 22. Will you state the negotiations with the Toledo Company, or Mr. Warren, that led up to the contract that Mr. Church has introduced in evidence?

A. The first time I saw Mr. Warren personally was some time in the fall of 1916—no, there had been one at least prior conversation, some time before that.

X-Q. 23. By whom? Do you know?

A. Yes, sir. Mr. Cutter.

X-Q. 24. Mr. Cutter was general manager of the company?

A. Yes, sir, he was general manager, I should say, from the first of April, 1916.

X-Q. 25. Had he any connection with the company prior to this reorganization?

A. No.

X-Q. 26. And you know officially, of course, Mr. Cutter's interview with Mr. Warren?

A. Yes, sir.

X-Q. 27. Have you any idea when that was?

A. Yes, sir.

X-Q. 28. When was that?

A. It was in August, 1916.

X-Q. 29. Proceed.

A. Shall I tell my own interview only, or the information I received officially and otherwise from Mr. Cutter?

X-Q. 30. You say that was August 15th, 1916?

A. No, in August, I don't know what time, but it was 1916.

X-Q. 31. You may tell in your own way what led up to the contract which Mr. Church has put in. If Mr. Church does not like the way you tell it, he can say so.

A. Well, immediately upon becoming connected with the company, I made every effort possible to simplify what I found to be the situation. The affairs of the company had dragged on without much activity for some years; and there were two problems which confronted us. The first was that we—I am speaking now of the old company, the Thomson Electric Welding Company, had no real opportunity to do business with the spot welders, because the sole selling rights were in the Universal Company, and I felt, and the directors felt, that unless that company was got out of the way in some way or stimulated to activity, our business was at a standstill. There was another problem which would arise immediately, if we solved the first one: That was to get adequate manufacturing facilities, because, owing to the way the business had been conducted, and the inactivity or lack of success or whatever, of the Universal Company, we were not well equipped to make spot welders in any adequate number. I immediately began negotiations with the Universal Company; I can not say the exact date, but I should say it was about as quickly as I could get to New York after I became president; and those negotiations continued through various phases until the middle of November, 1916. At the same time we were trying to get all the different lines we could on manufacturing facilities, but I felt that was not the more pressing problem, because we could not use those until we had got rid of the situation in which the Universal Company had us. I went to Plattsburg, I think it was about the 6th of August, 1916.

X-Q. 32. You mean the Plattsburg camp?

A. Yes, sir.

(Mr. Fish: Farley has been abroad, and therefore, had his training at Plattsburg.)

A. While I was there, my negotiations by letter continued with the Universal people, and Mr. Cutter wrote me that Mr. Warren had come on to see him, and of the substance of his interview with Mr. Warren.

X-Q. 33. This was in August?

A. This was in August, what time I don't know; I should say about the middle. I corresponded with Mr. Cutter about this, and

told him that the first essential for us was to know, if we were to have any dealings with Mr. Warren at all, was the physical valuation of his assets, and later, Mr. Cutter, after going to Toledo, wrote me a report of the result of his inspection there. I can not say when it was, that I saw Mr. Warren myself after that; it was probably in October, although my recollection is not definite. At any rate, I did see him once in New York fairly early in the fall, and we had a conversation about purchasing his assets. I rather staved him off at the time, because, while I was hopeful about making a trade with the Universal, the negotiations were somewhat up and down. We almost had it made one day, and then were on the verge of a violent quarrel the next, so I didn't want to be in any way committed to Warren before I was sure we could get the Universal contract. So I continued to try to carry on the two flirtations simultaneously, and ultimately, about the first of November, they were brought both to a head at about the same time. Now, I think it was the same night, the same date, not exactly, but within a couple of days, anyway, I got an option, after I had made a pretty definite arrangement with the Universal Company—from Mr. Warren, closed with the Universal, and then took up the option from Warren a month or so later, a 30-day option, as I remember it. I am not perfectly sure which came first, but they were practically simultaneous, and the two, from my point of view, seemed interdependent; I was not going to do either unless I could do both. Then those trades were made in November, I should say, about the first of November. I suppose I can refresh my recollection exactly on that here, I think (referring to memorandum). Well, the option with the Toledo Company was the second of November, and I think the agreement with the Universal was that day, or the preliminary agreement with the Universal was that day, or the prior day.

X-Q. 34. You say an option with the Toledo Company; do you mean option?

A. Yes, it is the first document in this printed exhibit. It is followed by a contract—or option. Well, there was a contract taking over all the assets; this is simply a five-line option, and then later we executed the formal agreement for taking over all the assets.

X-Q. 35. That is, the exercise of the option?

A. Yes, sir.

X-Q. 36. When was that, do you know?

A. I think it was November 22nd; I am not sure of the date. The bill of sale was executed on the 22nd.

X-Q. 37. You have spoken of the Universal, and your carrying the two trades along together; can you state what was the general character of the trade with the Universal that was consummated about the same time as the one with Toledo?

A. Yes. I don't know whether that is in here or not.

X-Q. 38. State from memory; I do not care for the particulars.

A. They had some outstanding contracts by which they were getting license fees or rentals, whatever, for some of these machines, and we bought all the contracts of the Universal, all their rights, title and interest of any kind in the spot welding machines, and all rights to any spot welding patterns, other than certain so-called product patents, for preferred stock in a new company which was to be formed.

X-Q. 39. And you got back all the contracts under the Harmatta patent?

A. They gave up all their rights whatsoever under the Harmatta patent and all other spot welding patents, the so-called spot welding patents. The trade was that this preferred stock was not to be in the original Thomson Electric Welding Company, but in a new company which was to be formed, which was to acquire the assets of the Toledo Company, and also all the assets of the old Thomson Company, relating to spot welding, including the Harmatta patent. This is, we tried to cut the thing in two, to put all the spot welding trade in one company, and all the butt welding trade in the other, and the trade was preferred stock in the new company to the Universal Company; the Thomson Company keeping, of having issued to it all the common stock in that new company. That new company is the Thomson Spot Welder Company, which is the present plaintiff. After the negotiations or closing of the trade on November 2nd or thereabouts, we went back to Boston to raise the money to buy the Toledo Company, and my recollection is we got it about the 22nd of November. That is largely dependent upon refreshing my memory on these dates. We carried out the trades practically simultaneously, forming the new company, issuing the stock to the Universal Company, and taking over the assets from the Toledo Company.

X-Q. 40. And you say your purpose in taking the Toledo Company was what?

A. It was to get an adequate method or adequate facilities for manufacturing welders with what the patent would do, in the way of increased business when we had a chance to run our own show instead of being dependent upon the inactivities of the Universal Company.

X-Q. 41. In taking up these negotiations with Mr. Warren of the Toledo Company, was the thing started *de novo*, or was it from your point of view a continuation of the negotiations?

A. Absolutely *de novo*. That is, not only that, but I know when I first talked with Mr. Warren, we were very chary about committing ourselves in anyway because of the situation with the Universal, and he seemed fairly shy about—he gave no definite assurance as to what he would or would not do.

X-Q. 42. In any sense, did he take up any of these negotiations and carry them through?

A. I never heard, although, I believe, there were—

X-Q. 43. The new officers of the Thomson Electric Welding Company had charge of those negotiations for that company?

A. Absolutely. I think they were all new, except one director and Mr. Hodges, the previous treasurer, whom we retired—I don't know—about as soon as we could.

X-Q. 44. Did the Universal Company play the game with you in trying to take any part in your negotiations with the Toledo Company?

A. I can not answer that question direct by yes or no. If I may state it in my own way?

X-Q. 45. State the facts.

A. I had a letter from Mr. Hodges of the Universal Company in August at Plattsburg, in which he was very much annoyed because Mr. Cutter and Mr. Warren had apparently been talking together about the possibility of some trade, and I could not quite make out why, but apparently because he thought we should have taken up anything new through him. I think his theory at first was to get Warren to trade with him and leave us out, but as the thing developed, he was quite ready to come along when he found he could not get Warren himself.

X-Q. 46. But he had nothing to do with that trade, with the trade of the Thomson Company?

A. No, absolutely not. He was quite cognizant of it, because I told him that was the way I proposed to pay him, in stock, which involved that trade.

X-Q. 47. His Honor has called attention to the fact that the record does not show any accounting with the Toledo Company, or even with the Barney & Berry Company. What was the fact as to the claim of the Thomson Electric Welding Company as it lay in your mind, as it was regarded by the company, after you took hold of the management, and how was that handled in this situation?

A. I have asked Mr. Stackpole, I suppose, 15 times why he did not hurry up and finish the accounting.

X-Q. 48. The Toledo Company was not a party to the suit in Massachusetts?

A. No, not technically, as I understand it.

X-Q. 49. I don't know the facts. Do you regard now that they have a claim against the Toledo Welding Company, a claim for damages?

A. That was one of the things wiped out, as I understand it, by the transaction. We had a very material one prior to that date, and it was that fact I urged as one of the reasons the Warren company had better sell.

X-Q. 50. That is, that was one of your trading arguments?

A. Yes, sir.

X-Q. 51. And the necessity for settlement was eliminated by this purchase?

A. Yes, sir, as I understood the original question; it also related to a contract with Mr. Warren.

X-Q. 52. Yes, that is the situation also.

A. I think that is in here (referring to pamphlet). I can not state exactly.

X-Q. 53. Is there anything else that occurs to you, Mr. Farley, that you would like to explain in reference to this matter?

A. I can not state exactly when we made that trade with Mr. Warren about his services, but I can state that it was subsequent to the time that the option of sale was given by him, because I remember—but perhaps the reason is not material. We talked it over a good deal just at and about the time we put through the final trade, and I think the contract is as of the same date. I can state at length the reasons for it, but I don't know as I am asked that.

X-Q. 54. Well, I will ask you to state the reasons why you made the contract, and all the reasons, and in particular whether it was in continuation of any trade or understanding or relation of any sort or kind?

A. Absolutely not, sir. It was a matter of grave doubt in our minds whether we should make a contract with Warren or not, and we expressly declined to commit ourselves about it or to have any negotiations about it at the time of getting the option. It was a question whether the advantage of getting it, on account of his knowledge of the business, some of his good will with his customers offset the possible disadvantage of having him with us, a man who had been on the opposite end as a rival, and we debated it pro and con and finally decided to take him primarily to see if he could not be worked out in what we called the Royalty Department; that is, with reference to making settlements or royalties on machines that users had had for some time, rather than to develop new business, and it was because we believed that he could be of great assistance to us in getting settlements or working out contracts such as we offered to every one of that nature, that we finally decided to employ him, and to employ him on a contingent basis which I personally felt was the way we would most likely get—I don't mean fully contingent, but partly contingent—which I personally felt was likely to produce most revenue for the company.

X-Q. 55. Did you know anything of the affairs of the Thomson Company or the Universal Company, anything of the conduct of the litigation by Mr. Warren or any of the elements of the situation, prior to the time, or shortly before you were elected president, when those facts as you have stated were called to your attention?

A. Never except a friend of mine, I should say about three or four weeks before Mr. Herrick gave me this proxy, I told him the Thomson Electric Welding Company had just won a very interesting suit, purely casually, and I never thought of it again, until by coincidence I happened to get interested in the company.

X-Q. 56. Who were the officers of the Thomson Company before you took hold of it, do you remember?

A. Hodges was treasurer, I think Mr. Spinney was president.

X-Q. 57. Do you remember Mr. Spinney's age, or did you know it?

A. I have been told it was somewhere in the 80's.

(The Court: What was his first name?)

(The Witness: Benjamin F. Spinney.)

X-Q. 58. (By Mr. Stackpole.) He is a shoe manufacturer in Lynn?

A. Oh, yes; he had retired at that time.

X-Q. 59. And you know what the qualifications of Mr. Hodges were in the position? I mean, by training.

A. He had a long experience.

X-Q. 60. What was his qualification by training before he had the position?

A. Prior to his going in, I haven't any idea.

(The Court: Do you make a distinction between training and experience?)

(Mr. Fish: I would like to have your Honor get the situation. I do not want to put that into the record, but I would like to have the witness explain it.)

X-Q. 61. Who were retained over?

A. Mr. Sprague was one of the directors and is still a director. He was the only one that stayed over, and Professor Thomson, who was and still is vice-president. That is all I recollect.

Redirect examination by MR. CHURCH:

Re-D. Q. 62. There is in the record in this case, introduced as part of the title papers apparently, some contracts between the Thomson Electric Welding Company and the Universal Company, dating back as early as June, 1909, and another one of July 20th, 1909; you know of those contracts, I suppose; are they not the ones by which the Universal Company acquired the rights to which you have referred?

A. I can not tell from your question. I have been all over those contracts, and there were prior contracts.

Re-D. Q. 63. And it was under those contracts, you understand, that the Universal Company got its right to lease spot welding machines? Is that correct?

A. They got them under existing contracts, of course, Mr. Church.

Re-D. Q. 64. I think quite a number, but the Universal Company, had the exclusive right to put out spot welding machines?

A. That is as I recollect those contracts. That is the effect of them. I don't know how long.

Re-D. Q. 65. And they put them out under licenses and the fruits of the licenses were realized by the Thomson Company, is that correct?

A. I think so. I think we were to get a fixed amount from each machine.

Re-D. Q. 66. And the rights of the Universal Company were exclusive and bothered the Thomson Company somewhat; is that the situation that was attempted to be cleared up?

A. I don't think "bothered" is the adequate word.

Re-D. Q. 67. Not strong enough?

A. It wasn't from my point of view. It had us tied hand and foot, gagged, and we could not move or wiggle.

Re-D. Q. 68. Those contracts and rights of the Universal Company under which it had exclusive rights to put out spot welders and receive license fees from people who acquired the machines were long before the issuing of the Harmatta patent in 1912?

A. I can not state as to that. My impression is—of course, the contracts will speak for themselves—my impression is they came—there is a long string of them, I think there were about seven contracts with modifications, and I can not remember the date the first comes in, and there is a reference to the Harmatta patent, but at what stage it was, I don't know.

Re-D. Q. 69. The Harmatta patent was not referred to until it was issued in 1912?

A. You are as able to judge of that as I am.

Re-D. Q. 70. That is the fact?

A. I don't know. It is a fair assumption.

Re-D. Q. 71. Is it not a fact that the Universal Company, long before the issuance of the Harmatta patent here in suit, was putting out spot welding machines, leasing them, and was deriving a profit from them under the authority of the Rietzel patent of July, 1909?

A. I don't know anything about it. I should be surprised if that was so, but it might be, yes or no, as far as my knowledge is concerned.

Re-D. Q. 72. You are the president of the Thomson Spot Welder Company, are you not?

A. I am.

Re-D. Q. 73. And custodian of all those contracts?

A. No, I don't suppose I am.

(Mr. Fish: What has this to do with the subject we are discussing? Mr. Farley says he knows nothing about this proposition.)

Re-D. Q. 74. Let us come back to what you did testify to. You say you were put into this company as a sort of stop gap for Mr. Herrick?

A. No, I did not say any such thing.

Re-D. Q. 75. Is that a fact?

A. No.

Re-D. Q. 76. Who is Mr. Herrick?

A. He is my senior partner.

Re-D. Q. 77. Is he a lawyer?

A. Yes, sir.

Re-D. Q. 78. What is his full name?

A. Robert F.

Re-D. Q. 79. He is a lawyer?

A. Yes, sir.

Re-D. Q. 80. You are a lawyer, are you not?

A. Yes, sir.

Re-D. Q. 81. And Mr. Daniel J. Lyne, clerk of the Thomson Electric Welding Company, present in court, is a lawyer, is he not?

A. Yes, sir.

Re-D. Q. 82. Are there any other lawyers who have offices in this Thomson Electric Welding Company?

A. I don't think so.

Re-D. Q. 83. It would appear, then, that this spot welding company is represented by lawyers with offices?

A. If that is an observation, it is unwarranted; if it is intended as a statement of fact, it is inaccurate.

Re-D. Q. 84. Well, the president is a lawyer, and the clerk of the corporation is a lawyer, and the gentleman you represented and in whose behalf you were made president——

A. Mr. Church, I have already corrected you once in that statement.

Re-D. Q. 85. How is that?

A. That I did not primarily represent Mr. Herrick as president.

Re-D. Q. 86. You did not?

A. I did not.

Re-D. Q. 87. You were made president because he was going out of the country, is that correct?

A. No, I don't think so. That is one element, if you want to argue——

Re-D. Q. 88. No, I don't wish to argue at all. I just wanted to get the facts. Now, the fact is your interest in this company commenced in November, 1916?

A. That is not.

Re-D. Q. 89. When did you commence?

A. In March, 1916.

Re-D. Q. 90. Now during the course of the Barney & Berry suit, were you not an officer of the Thomson Company?

A. I have already stated I had never heard of the company at that time.

Re-D. Q. 91. So that you don't know anything about any transactions that may have occurred between——

A. You are not seriously asking me that I don't know anything about something I never heard of, are you, Mr. Church?

Re-D. Q. 92. Will you answer my question?

A. No, I don't know.

Re-D. Q. 93. I suppose lawyers like to argue a proposition.

A. I am afraid so. I will try to refrain.

Re-D. Q. 94. I think that is all.

(Mr. Fish: That is all, unless something occurs to you that will throw light upon the matter.)

(Mr. Church: You may cross-examine Mr. McBerty.)

F. P. McBERTY.

F. P. McBERTY, recalled for cross-examination, testified as follows:

Examined by MR. STACKPOLE:

X-Q. 376. Will you let me see the letter you refreshed your recollection from just recently about—

(Witness hands paper to counsel.)

(Mr. Fish: You may go on with the cross-examination, Mr. Stackpole, and let me look the letter over.)

X-Q. 377. (By Mr. Stackpole.) In the spot welding experiments you made this morning at the factory of the Ford plant, with the machine here, is that machine in exactly the same condition in all respects as it was at the factory of the Warren Electric & Specialty Company in 1901, when you made your alleged spot welds that year?

A. It is not.

X-Q. 378. How does it differ?

A. We have two new cam levers to replace the original cam levers, apparently lost some time after the use of the machine was discontinued.

X-Q. 379. Is that all the difference?

A. There is new fibre insulation between the two halves of the bed plate.

X-Q. 380. Anything else?

A. I would not want to say that the dies are the original dies; I know the copper electrodes I used today were the copper electrodes I used at that time.

X-Q. 381. What do you mean by dies?

A. The two movable parts that are arranged to clasp the electrodes or clamp the arms.

X-Q. 382. You would not swear that the clamps or dies were the same then?

A. No, I would not be in position to swear they were the same.

X-Q. 383. Are they exact reproductions?

A. They are as near exact reproductions as an ordinary mechanical equipment is made of that type.

(The Court: You mean they may or may not be the originals, or that you don't know?)

(The Witness: They may or may not be the originals; that is so.)

X-Q. 384. (By Mr. Stackpole.) Are the electrodes the original ones?

A. In referring to the electrodes, what particular part do you refer to?

X-Q. 385. I thought you understood that; the copper rod held by the clamps between which the work is pinched and spot welded.

X-Q. 386. You refer to my spot welding points?

A. Yes, sir.

X-Q. 387. I said they were not.

A. They were not.

X-Q. 388. They were not? I thought you said they were.

A. They were not.

X-Q. 389. Are they exact reproductions?

A. As near as I can produce them.

X-Q. 390. Did the originals have the shoulders on them that these electrodes have?

A. They did.

X-Q. 391. And was that kind of electrode the only kind you used in 1901 for spot welding?

A. That was the only kind I used successfully.

X-Q. 392. What other kind did you use?

A. We used just plain rounded copper wire without the shoulder on.

X-Q. 393. But they were the straight electrodes like this, with or without shoulders?

A. No; the first sets were formed to fit the dies, because the first set of dies that were in the machine when the spot welding was done were curved.

X-Q. 394. Were curved to fit the curvature of the dies used for the plane dies?

A. Yes, sir.

X-Q. 395. And then you made some new dies?

A. Yes, sir.

X-Q. 396. And those were straight dies?

A. Yes, sir.

X-Q. 397. And you used straight electrodes?

A. Yes, sir.

X-Q. 398. And nothing else for electrodes?

A. That is all I have any knowledge of.

X-Q. 399. So we know now you used this and nothing else. You are positive of that, are you?

A. No I am not saying positively that I used nothing else. We experimented with other types.

X-Q. 400. In making electrodes did you use anything else?

A. I used offset electrodes at one time.

X-Q. 401. What do you mean by offset electrodes?

A. The fact that it is bent so the point of contact is not in direct line with the die, but slightly above it.

X-Q. 402. An S-shaped?

A. No, a Z-shape, I would say.

X-Q. 403. And which electrode did you use—

A. The fan blades were electrically welded with the straight electrodes; we could not supply sufficient power with these Z-shape electrodes.

X-Q. 404. So on the fans you used the straight, not those that were bent up?

A. Yes, sir.

X-Q. 405. Why did you use the curved electrodes?

A. There was an insulation in the center of the machine which prevented us getting our work down at the proper height.

X-Q. 406. How many fan blades did you weld with those?

A. I would not want to say.

X-Q. 407. Did you ever weld a complete fan blade with them?

A. I would not want to say whether I made a complete one or not.

X-Q. 408. When did you first use the offset electrodes, what part of the year?

A. That was the first effort I made to weld fan blades to the center.

X-Q. 409. And you used that because there was an insulation running the whole length between the bottom plates?

A. Running the whole length, and I could not get my blade in low enough to reach it.

X-Q. 410. Why did you cut out the insulation?

A. So I could put the blade in between the openings of the two plates and use my straight electrode, which gave me more pressure and better contact.

X-Q. 411. Was there any other reason for removing the fibre?

A. No, none that I know of.

X-Q. 412. Did you ever tell anybody you removed it or had removed it for any other reason?

A. I would not want to say that.

X-Q. 413. You remember telling Mr. Howe that?

A. No, sir, I would not say that.

X-Q. 414. Mr. Howe spent two weeks with you?

A. I would not want to say it was two weeks.

X-Q. 415. You remember he took your affidavit?

A. Yes, sir.

X-Q. 416. And you took him around to other people?

A. Yes, sir.

X-Q. 417. And you don't remember whether you told him you cut away this fibre or not?

A. I don't remember whether I told him I cut away the fibre or told him any reason why I cut away the fibre.

X-Q. 418. Now, what time of the year did you cut away that fibre?

A. That fibre was cut away when we first welded our blades.

X-Q. 419. What time of the year was that?

A. That was in the early spring.

X-Q. 420. What do you mean by early spring?

A. In either January or February.

X-Q. 421. Do you call January or February spring?

A. Yes, I would call it the spring period.

X-Q. 422. That is an accurate statement, is it?

A. Yes, sir.

X-Q. 423. And you made these fan blades early in January?

A. Either early in January or the first of February; that is, the first part of February.

X-Q. 424. Did you make any in January?

A. I would not say.

X-Q. 425. How do you identify February as the month?

A. I identify February as the month on account of my first piece of work being produced, which was produced in February.

X-Q. 426. What is that, Exhibit M?

A. I don't remember the number of the exhibit.

(Mr. Stackpole: Has your Honor that?)

(The Court: Yes.)

X-Q. 427. That has stamped on it February 15, 1901, I believe.

A. Yes, sir.

X-Q. 428. Had you made any complete four-bladed fan blades at that time?

A. I think not; otherwise, it would not have been stamped as my first production along those lines.

X-Q. 429. Had you made any before that?

A. No.

X-Q. 430. Where did you get the blade that was not punched?

A. We may have had it in stock there.

X-Q. 431. Were your ordinary blades punched with rivet holes?

A. Oh, yes; the ordinary blades were punched.

X-Q. 432. For that type of fan?

A. No, sir.

X-Q. 433. For any type of fan?

A. No.

X-Q. 434. For that particular type of fan, you punched the blade for rivet holes?

A. Yes, sir.

X-Q. 435. It was after that time?

A. What do you mean by "after that time?"

X-Q. 436. When they decided to continue the manufacture of that type of fan.

(The Court: Here is the exhibit you asked for, Mr. Stackpole.)

(Mr. Fish: Here is the letter which I will give back into your custody, Mr. McBerty.)

X-Q. 437. When the blades were first gotten out for this type of fan, were they punched for rivet holes, or were they not?

A. I would not want to say.

X-Q. 438. Why not?

A. Well, it is a matter of recollection, and it is a long time ago.

X-Q. 439. At any rate, did you weld any blades that were punched, and spiders?

A. Yes, sir.

X-Q. 440. And welded blades that were not punched with spiders?

A. Yes, sir.

X-Q. 441. And I believe you said that you welded four blades to some of the spiders?

A. Yes, sir, I have welded four blades to every spider that was a complete fan.

X-Q. 442. How many of those were there?

A. I must be rather indefinite, 15 or 16.

X-Q. 443. Were they all made in one day?

A. I won't say that.

X-Q. 444. In how many days were they made?

A. I cannot say that.

X-Q. 445. Were they all made in a week?

A. I am under the impression they were in less time than that.

X-Q. 446. In the ordinary commercial production of fans, how many complete assemblage of blades and spiders would be made in a day?

A. It depends entirely upon our shop orders; if those parts would equal the work being produced.

X-Q. 447. What was the average at that time?

A. I don't recollect. I did not work at it myself.

X-Q. 448. It would be more than 15, or more than 10?

A. Oh, yes.

X-Q. 449. Did you run it any nights?

A. I would not say that.

X-Q. 450. Well, you might?

A. I might, if you say so.

X-Q. 451. I don't say so. Say it yourself. Fifteen or 16 completed fan blades which you made represent only a part of a day's work?

A. If the operator worked at it continuously, it is altogether likely it would represent nights and days.

X-Q. 452. It might be done in an hour?

A. I don't think so.

X-Q. 453. Could you weld them in an hour?

A. I would not say that.

X-Q. 454. What do you think?

A. If I had an up-to-date equipment, I could.

X-Q. 455. Could you weld them in that time in that machine?

A. I should say not.

X-Q. 456. Why do you say not?

A. Because it would over-heat that machine.

X-Q. 457. You could do it except for over-heating the machine?

A. Yes, sir, I believe if I handled them as fast as we handled them this morning, I believe I could.

X-Q. 458. Suppose you handled it as fast as you handled this machine, how many could you handle in an hour?

A. Oh, I should say I could do 10 or 12 or 15.

X-Q. 459. In an hour?

A. Yes, sir, I should say so.

X-Q. 460. That would be four minutes to each one?

A. Yes, sir.

X-Q. 461. And there are 12 spot welds to be made on each one?

A. Yes, sir.

X-Q. 462. And you would use the little jigs you used this morning to hold the blade in position?

A. Yes, sir.

X-Q. 463. Did you have that in 1901?

A. Not that one. I had one of practically the same type, I would say.

X-Q. 464. Did you tell Mr. Howe that?

A. I don't remember.

X-Q. 465. Did you tell Mr. Howe you completed four blades for fans?

A. I don't remember that part either.

X-Q. 466. Did you tell Mr. Howe that any of these completed spot-welded fans and spiders went into assembled fans?

A. I won't say definitely as to that, but my impression is I think I did.

X-Q. 467. You think you did?

A. Yes, sir.

X-Q. 468. Now, do you remember your affidavit that you made?

A. I remember making an affidavit.

X-Q. 469. And in that affidavit you stated the facts as you understood them, or did you intend to deceive in that affidavit?

A. No, I did not. I may have stated facts as they occurred to me at that time. If my memory was refreshed in what I had done the year before—

X-Q. 470. What would refresh your memory since then?

A. I have looked up the various operators we had, looked the stock over, studied the machine more.

X-Q. 471. You have studied the machine more?

A. Yes, sir.

X-Q. 472. When did you study the machine?

A. I have studied various types in the last year.

X-Q. 473. I say when?

A. I could not say.

X-Q. 474. The last year, 1917?

A. I would say I have, yes, sir, during the last year.

X-Q. 475. Did you have your machine at your factory in 1917?

A. Yes, sir.

X-Q. 476. How long?

A. I could not say definitely.

X-Q. 477. That is only a year ago; you ought to be able to remember that. What month was it in?

A. I cannot tell you that.

X-Q. 478. Your memory is good for 18 years, but not good for two years? Is that it?

A. On particular items, and when I refer to correspondence, I could locate very close to the length of time I have had the machine.

X-Q. 479. Two years ago?

A. Yes, sir.

X-Q. 480. I wish you would try to locate the exact time when you had the machine in the company's plant in 1917? The exact date it was shipped from there.

A. Where it was shipped to?

X-Q. 481. Where was it shipped?

A. It was shipped to Canton at one time.

X-Q. 482. Did it come back from Canton?

A. Yes, sir.

X-Q. 483. Did it come back the same year?

A. I will not say.

X-Q. 484. It came back in the year 1918?

A. It didn't.

X-Q. 485. Did it come back in the year 1919?

A. It did.

X-Q. 486. What time?

A. About two weeks ago, I would say.

X-Q. 487. All that time, between whenever it went from your factory to Canton, and now, it has been out of your possession until recently? Until the last two weeks?

A. Whenever it went, it has been out of my possession until it was brought back to Warren recently.

X-Q. 488. Now, if you can, I would like to have you refresh your recollection as to when it was shipped to Canton.

A. I cannot do that here. I have no records here with reference to the shipment of the machine to Canton.

X-Q. 489. When it was at the National Electric Welder Company at—where is the National Electric Welder Company?

A. Warren, Ohio.

X-Q. 490. —at Warren; how many months was it there?

A. Well, I am not in position to say.

X-Q. 491. Why not?

A. Because I would have to check up the date it was delivered to me and check up the date it was shipped.

X-Q. 492. Can you tell me how many months it was there?

A. No; you are asking me to make a definite statement on months, and I am not in position to make such a definite statement.

X-Q. 493. Was it three months?

A. I would not say.

X-Q. 494. Was it four months?

A. Yes, sir.

X-Q. 495. Six months?

A. Yes, sir.

X-Q. 496. Was it seven months?

A. Yes, sir.

X-Q. 497. Was it eight months?

A. Yes, sir.

X-Q. 498. Was it nine months?

A. Yes, sir.

X-Q. 499. Was it ten months?

A. Yes, sir.

X-Q. 500. Was it 12 months?

A. Yes, sir.

X-Q. 501. It was there 12 months in the year of 1917?

A. No, I didn't say that; you didn't mention 1917. You asked me how many months it was there from the time it was brought there.

X-Q. 502. In the year 1917 how many months was it there?

A. I cannot say.

X-Q. 503. Was it there one month?

A. I could not say.

X-Q. 504. Can't you remember two years ago how many months that machine was in your factory in Warren?

A. No, I cannot make a statement like that.

X-Q. 505. While it was in your factory in 1917, did you do any spot welding on it?

A. I did.

X-Q. 506. What did you weld then?

A. I welded some fan blades.

X-Q. 507. On the spiders?

A. Yes, sir.

X-Q. 508. And to whom did you show that operation?

A. I think I showed that operation to Mr. Pattison.

X-Q. 509. Anybody else?

A. Yes, sir.

X-Q. 510. Who?

A. Several of them.

X-Q. 511. Who?

A. That is difficult to say. I think I have shown it to Captain Smith and one of your representatives, Newton A. Smith. I cannot say exactly; it was no secret that we had the machine, or that it could be used for welding.

X-Q. 512. You had at the same time other spot welding machines in your factory, the National, had you not, in 1917?

A. I would say we had.

X-Q. 513. Did you do any spot welding on those at that same time?

A. I did.

X-Q. 514. Did you weld any fan blades to fan spiders on those machines?

A. I would not say I did.

X-Q. 515. Or you would not say you didn't?

A. No.

X-Q. 516. You might have?

A. Yes, sir.

X-Q. 517. And you showed those fan blades you might have welded on those machines to Mr. Pattison?

A. I won't make a definite statement on that. I would not say clearly on that.

X-Q. 518. Where did the transformer of this machine come from?

A. It came from the transformer department of the Warren Company of Warren, Ohio.

X-Q. 519. Had that transformer ever been to Freehold?

A. The records indicate it did.

X-Q. 520. What records?

A. The old original transformer record of the Warren Company.

X-Q. 521. You mean the McCurdy book?

A. No.

X-Q. 522. Mr. McCurdy prepared it?

A. He is the man that produced that book from the files of the Enterprise Electric Company of Warren.

X-Q. 523. Did the Warren Company make any other transformer about that time, the first part of 1901, as far as working for this electric welding job?

A. Yes, sir.

X-Q. 524. Is that the transformer?

A. No, that is not the one. That is not the second transformer.

X-Q. 525. That is not the one that was made the latter part of 1900?

A. No, that was made in June.

X-Q. 526. And this transformer is the one that went to the Freehold plant? This went there and the other went there also?

A. Yes, sir.

X-Q. 527. This is the one that came back from Freehold?

A. Yes, sir.

X-Q. 528. It is not the one that stayed at Freehold?

A. No, it is not.

X-Q. 529. And it is the one that Mr. McCurdy testified to in this case?

A. I don't know what Mr. McCurdy testified to. You will have to excuse me from testifying on that.

X-Q. 530. Haven't you read his testimony?

A. No.

X-Q. 531. As I recall it, a transformer was sent to Freehold to the Pneumatic Wheel Company some time in June, 1900, and it came back some time in January, 1901, and according to the record, it was sent to the fan motor department January 20th, 1901. Does that accord with your recollection?

A. No. Did Mr. McCurdy testify that way?

X-Q. 532. Does that accord with your recollection?

A. Not that statement, it does not.

X-Q. 533. When did it come back?

A. I am not in a position to say.

X-Q. 534. How is that statement incorrect?

A. I don't think Mr. McCurdy made the statement that the transformer came back in January, 1901.

X-Q. 535. Did you agree with him it was delivered to the fan motor department January 20th, 1901?

A. According to the record.

X-Q. 536. And it came back from Freehold then?

A. I don't know.

X-Q. 537. It came back before January 20th, 1901?

A. It must have.

X-Q. 538. And subsequent to June?

A. Yes, sir.

X-Q. 539. And it came back after Mr. Craft went there, did it?

A. I understand it must have.

X-Q. 540. When did Mr. Craft go there?

A. I am not in a position to say definitely.

X-Q. 541. Do you recollect his going?

A. I recall the time when Mr. Craft was with us. I know he was with us during that time.

X-Q. 542. And it was after January 20th, 1901, you fitted up this machine with this transformer to do butt welding?

A. Yes, sir.

X-Q. 543. And that was the first time you had done any butt welding in the Warren plant?

A. To my knowledge.

X-Q. 544. Now, how many turns are there in the primary of that transformer?

A. I am not in a position to say.

X-Q. 545. How many turns in the secondary?

A. There are four turns in the secondary.

X-Q. 546. Do you know what kind of wire is used in the primary?

A. Nothing more than as my recollection serves me, the machine is wound with No. 12 square.

X-Q. 547. No. 12?

A. I won't say for sure.

X-Q. 548. How was it in this actual machine?

A. I don't know. I had nothing to do with the wrapping.

X-Q. 549. Did you ever change that transformer after it came back?

A. In respect to what?

X-Q. 550. With respect to any part?

A. No.

X-Q. 551. With respect to the winding of the primary?

A. No.

X-Q. 552. Is it in the same condition it was when it came back from Freehold?

A. I cannot say.

X-Q. 553. Did you change it after it came back from Freehold?

A. I am not in a position to say that.

X-Q. 554. Do you know of any change?

A. Not to my knowledge.

X-Q. 555. So far as you know, it is identically as it was when it came back from Freehold?

A. So far as I know.

X-Q. 556. So far as you know, it is identically the same as it was when it went to Freehold?

A. Yes, sir.

X-Q. 557. Now, it was used this morning with a voltage across the terminals of the welder of $4\frac{1}{2}$ volts?

A. Yes, sir.

X-Q. 558. Is that the same voltage you used in your work at Warren on the fan guard rings?

A. That is a question I cannot answer definitely for the reason I had no low volt meter, a volt meter of the proper calibre to read the voltage of the secondary on this motor.

X-Q. 559. You had none with you now or at that time?

A. I never had.

X-Q. 560. I notice on this machine there were several taps on the primary.

A. Yes, sir.

X-Q. 561. And as on a transformer the primary was connected to the four volt taps; did you notice that?

A. I did not notice that.

X-Q. 562. Was it connected with the same taps they used in Warren?

A. I could not say.

X-Q. 563. Why can't you say?

A. Because I have not looked it over; I have not paid attention to it with reference to that particular action.

X-Q. 564. But it is the same transformer that went to Freehold?

A. I won't say that is the same transformer that went to Freehold. The records indicate it is.

(The Court: Have you any personal recollection of it?)

A. My present recollection is that the transformer was turned over to the fan department by the transformer department for that job, and I was not in the transformer department; that was handled by Henry W. Wiswell.

X-Q. 565. How wide was the insulation between the two clamp pieces when you used the machine for butt welding in 1900?

A. I would say three-eighths of an inch, and that is a guess.

X-Q. 566. That is narrower than it is now?

A. Yes, sir.

X-Q. 567. How much narrower?

A. I think it is very close to three-eighths of an inch narrower.

X-Q. 568. So it is double the distance now that it was?

A. I would not say that. My recollection is it was three-eighths of an inch before.

X-Q. 569. And about three-quarters of an inch now?

A. I think so. I have not measured it.

X-Q. 570. Now, that was when it was used for butt welding; when you used it for spot welding, did you change the separation of the plates?

A. Yes, sir.

X-Q. 571. Took out the fibre and put in another one?

A. Took out the fibre and put in a wide space in there.

X-Q. 572. What else did you do to accomplish the result? Did you change the machine in any way?

A. I shortened up the fibre so that the space between the front of the machine beyond the clamping die was free, extending it down through that opening.

X-Q. 573. Did you move the plates on the bench?

A. I would not say as to that. You mean the entire machine?

X-Q. 574. No. I mean one side or the other.

A. I would not say. The chances are when you spread it out you would have to move the plates.

X-Q. 575. But you don't recollect of moving the plates?

A. I don't recollect. I was not there.

X-Q. 576. Do you remember whether you bored holes in the bench to bolt the plates?

A. That would be turned over to some mechanic to attend to.

X-Q. 577. You were making experiments yourself?

A. Yes, sir.

X-Q. 578. And were giving instructions as to how changes were to be made?

A. Yes, sir.

X-Q. 579. Instructions as to the changing of the fibre?

A. Yes, sir.

X-Q. 580. Instructions as to moving the bottom plate?

A. Yes, sir.

X-Q. 581. So you would know whether they were done or not when you came to view the machine?

A. I would certainly see that part of it.

X-Q. 582. And you would move it about three-eighths of an inch?

A. I think about that.

X-Q. 583. Did they move one or both plates?

A. I don't know.

X-Q. 584. What do you think?

A. I could not say that.

X-Q. 585. You don't recall?

A. No.

X-Q. 586. Now was the machine used with the bent-up electrodes with the bed plates three-eighths of an inch apart?

A. Yes, sir, it was.

X-Q. 587. Was it used with straight electrodes three-eighths of an inch apart?

A. For some small work, just as I made a demonstration of what could be done in welding.

X-Q. 588. Now, you left the Warren Company in what year?

A. Nineteen hundred and two.

X-Q. 589. And where did you go?

A. I went to work for the Peerless Electric Company.

X-Q. 590. That was a continuation of the Warren Company, was it not?

A. No.

X-Q. 591. So far as the place, the building, was concerned?

A. It continued in the manufacture of fans, and under the new administration of the Peerless Electric Company.

X-Q. 592. When was that change made? What time in 1902?

A. Some time in 1902, but I was not familiar with its office affairs, and consequently I am not in a position now to make a definite statement as to that.

X-Q. 593. Did they put out these same types of fans?

A. They did.

X-Q. 594. With the blades riveted to the spiders?

A. Yes, sir.

X-Q. 595. That was the regular output?

A. That was at that time.

X-Q. 596. The Colonial Fan, who put that out?

A. The same firm.

X-Q. 597. Was that made in the same way as the other?

A. Yes, sir.

X-Q. 598. With steel blades?

A. The same.

X-Q. 599. And with steel guard rings?

A. Some of them.

X-Q. 600. Did the Colonial fans that had steel guard rings have steel blades?

A. Not always.

X-Q. 601. Was there any regularity about that?

A. Not any great amount of it.

X-Q. 602. You mean they used whatever they happened to have?

A. They used whatever they thought they could use to advantage.

X-Q. 603. Was that true also of this Peerless G-2 fan?

A. Yes, sir. In reference to the G-2 we called them steel blades and steel centers.

X-Q. 604. And how was the Colonial fan made up?

A. The high grade fans had some brass blades and some steel blades with brass centers, some centers of steel and some brass centers.

X-Q. 605. Did you do any of this spot welding in 1902?

A. No, not to my knowledge.

X-Q. 606. When was the last time you did any spot welding?

A. I could not say.

X-Q. 607. In 1900 and 1901, anyhow?

A. I would not say offhand; some in 1901.

X-Q. 608. Could you give any month?

A. No.

X-Q. 609. Did you do any butt welding, say, after May 1st?

A. I would not say.

X-Q. 610. You cannot say you did any after May 1st? Will you put it that way? Will you swear you did make spot welds on that machine after May 1st, 1901?

A. I will not.

X-Q. 611. So that you do not feel definite about that?

A. No.

X-Q. 612. Now, how about April 1st? Will you swear you made spot welds on that machine after April 1st, 1901?

A. No, sir.

X-Q. 613. Will you swear you made spot welds on that machine after March 1st, 1901?

A. No, I would not swear to that.

X-Q. 614. Are you willing to swear you made spot welds on that machine after February 1st, 1901?

A. Yes, sir.

X-Q. 615. Will you swear you made spot welds on that machine before January 1st, 1901?

A. No, sir.

X-Q. 616. Will you swear you made spot welds on that machine before February 1st, 1901?

A. No, sir.

X-Q. 617. Then it comes down to this, that what you will actually swear to is that you won't swear you made spot welds on that machine after March 1st, 1901?

A. No.

X-Q. 618. And you won't swear you made them before February 1st, 1901?

A. No.

X-Q. 619. By "no" you mean I am right?

A. I mean I won't swear I did any spot welding before February 1st, 1901.

X-Q. 620. Will you swear you did spot welding after March 1st, 1901?

A. No.

X-Q. 621. But you will swear that between February 1st and March 1st you did spot welding?

A. Yes, sir.

X-Q. 622. And that is all you will swear to, as far as the dates are concerned?

A. That is all I will swear to in this particular instance here.

X-Q. 623. Of course; and you understand you are under oath here?

A. Yes, sir.

X-Q. 624. And swearing to the truth?

A. Yes, sir.

X-Q. 625. Now, after 1902, where were you employed?

A. At the Peerless Electric Company.

X-Q. 626. For how long?

A. Until 1906.

X-Q. 627. Was this machine employed during that time?

A. Yes, sir.

X-Q. 628. And for what purpose?

A. Welding fan guard rings.

X-Q. 629. But not any blades or spiders?

A. Not to my knowledge.

X-Q. 630. And what was your position?

A. I was superintendent of the Peerless Electric Company.

X-Q. 631. You would have known about it if they had?

A. Not necessarily.

X-Q. 632. They might have done it secretly?

A. No. It might have gone through the shop for weeks at a stretch and I not know it.

X-Q. 633. As superintendent, you would not know it?

A. No, as superintendent, I would not know it.

X-Q. 634. And you stayed with the Peerless Company until when?

A. Until 1906, I think.

X-Q. 635. Then where did you go?

A. Then I went into business myself.

X-Q. 636. What business?

A. The manufacture of transformers.

X-Q. 637. So you know something about transformer manufacture?

A. Yes, sir.

X-Q. 638. Is that the first time you really became what might be called familiar with transformer manufacture?

A. Oh, no, I had been gathering information on the transformer business right along in my experience in the transformer department.

X-Q. 639. And from 1906, when did you next see this welding machine?

A. The next definite knowledge of seeing this welding machine was the latter part of 1911.

X-Q. 640. And between that time, so far as you know, where had it been?

A. At the plant of the Peerless Electric Company.

X-Q. 641. Had you visited that plant in the meantime?

A. Occasionally.

X-Q. 642. Did you know their output in the way of fans?

A. Yes, sir; they were producing fans, I know.

X-Q. 643. You know they were producing electrically welded guards on the fans?

A. I had no definite knowledge of that.

X-Q. 644. You did not know of that?

A. No.

X-Q. 645. The next time you saw the machine was in 1911?

A. Yes, sir.

X-Q. 646. Do you remember what month of the year?

A. I would not say what month; in the late fall or early winter of 1911.

X-Q. 647. Did you buy it yourself?

A. Yes, sir.

X-Q. 648. Why did you buy it?

A. I thought it might be of advantage to me in a later transaction.

X-Q. 649. In a later transaction?

A. Yes, sir.

X-Q. 650. What kind of a transaction?

A. In case of somebody's wanting to know what had been done in the electric welding line in the early days.

X-Q. 651. So that in 1911 you had a very good idea of what you had done in your early days?

A. Yes, sir.

X-Q. 652. And those ideas were still in your mind in 1913, were they not?

A. Yes, sir.

X-Q. 653. They had not escaped at that time?

A. No.

X-Q. 654. And you had that machine in your possession then?

A. Yes, sir.

X-Q. 655. When Mr. Howe came there?

A. Yes, sir.

X-Q. 656. Was it connected up with the transformer it is now furnished with?

A. I think it was connected up.

X-Q. 657. And you showed Mr. Howe some spot welding?

A. I think I did.

X-Q. 658. That would be the natural thing to do?

A. That would be the natural thing for me to do.

X-Q. 659. And when you bought that machine, you also bought the transformers?

A. I Bought the entire equipment.

X-Q. 660. And when you bought them, how were they connected up?

A. When I bought them, they were not connected together.

X-Q. 661. They were not?

A. No.

X-Q. 662. What was the Peerless Company doing with it? Anything?

A. They were in the garret of the Peerless Company.

X-Q. 663. And they were separated?

A. Yes, sir.

X-Q. 664. Were the two parts separated?

A. No, they were attached together.

X-Q. 665. How were they attached together?

A. They were attached to a face plate.

X-Q. 666. And that has been removed?

A. Yes, sir.

X-Q. 667. Why did you take that off?

A. Because we could not put it in the shape it was in when we did our spot welding, with that slate base.

X-Q. 668. So far as you know, had the Peerless Company used them with the slate base?

A. They had used it for a while, I am confident.

X-Q. 669. Did that slate base run all the way under the plates?

A. Yes, sir.

X-Q. 670. So that there was no hole in between the metal so that you could put a fan blade in?

A. I don't believe you could put a fan blade in between. I would not say definitely on that situation.

X-Q. 671. Did you tell Mr. Howe that you found it on a slate base?

A. I would not say definitely as to that.

X-Q. 672. But you told him you bought it in 1911 of the Peerless Company?

A. I won't say definitely as to that.

X-Q. 673. But you do recall making some spot welds for him?

A. No, I don't.

X-Q. 674. I thought you said a moment ago you did?

A. No, I said I might.

X-Q. 675. But you do recall making spot welds in 1901?

A. Yes, sir.

X-Q. 676. But not when Mr. Howe came to see you?

A. No.

X-Q. 677. Your recollection is better for the 18-year period than it is for the six-year period?

A. Yes, sir.

X-Q. 678. Now, what did you do with it in 1911?

A. I did not do anything with it in 1911.

X-Q. 679. Just bought it?

A. Bought it and kept it.

X-Q. 680. Bought it to refresh your recollection?

A. No, bought it for the sake of a future use if I found it desirable to have it for information.

X-Q. 681. I don't quite get your idea of future use. I would like to have you tell me what you mean by future use.

A. If somebody wanted me to demonstrate what I had done in the early days in the spot welding line, that machine would enable me to do it.

X-Q. 682. Of course, when Mr. Howe came to you, you demonstrated it?

A. I did not say so.

X-Q. 683. But you bought it for that purpose?

A. No.

X-Q. 684. You just said you bought it for demonstration?

A. Yes, sir.

X-Q. 685. But not demonstration for Mr. Howe?

A. No.

X-Q. 686. How long did you keep it after you bought it in 1911?

A. I can not say that.

X-Q. 687. When did you first make use of it after 1911?

A. I don't know as I used it until 1913. I believe I set it up to see if the electric connections were all right, and tested it out.

X-Q. 688. And when you bought it, you said it was on the same base. When did you first put it on this dirty, old board?

A. That was put on the so-called dirty old board in 1917, I guess.

X-Q. 689. The rest of the primary is nice and clean. Why put it on that dirty board?

A. Probably because we had no other hard wood handy.

X-Q. 690. Why did you want a hard wood board?

A. Because it was dry and solid.

X-Q. 691. Was it on hard wood there in the Warren Company's factory?

A. My recollection is it was on a heavy maple bench.

X-Q. 692. Of about the same thickness?

A. I could not say.

X-Q. 693. Was it on slate?

A. It had a cut in it for the bottom of the machine that it set in.

X-Q. 694. How long was that?

A. I could not say.

X-Q. 695. An inch thick?

A. I could not say.

X-Q. 696. Two inches?

A. I don't say.

X-Q. 697. How thick was the cut?

A. I don't say.

X-Q. 698. Was the cut three inches long?

A. I would not say.

X-Q. 699. Was it four inches long?

A. I would not say.

X-Q. 700. Was it six inches long?

A. I would not say.

X-Q. 701. Was it four inches long?

A. I would not say that either.

X-Q. 702. You don't recall that?

A. I recollect there was a cut in the bench.

X-Q. 703. But you don't know whether it was an inch long, or a foot long?

A. No, when it comes to making a definite statement like that, I would not say.

X-Q. 704. Was it two feet long?

A. No, I think not, because I don't think the board was that wide.

X-Q. 705. Will you deny it was a foot long?

A. I won't make any statement on that.

X-Q. 706. Will you deny that machine overlapped the edge of the bench as much as it does now?

A. My notion is it was about the same now. That was the intention.

X-Q. 707. Will you swear it was mounted just as it is now?

A. I will not.

X-Q. 708. How far beyond the end of the bench did the plates overlap, that you will positively swear to?

A. I will not positively swear to any distance; I haven't definite information; I can not give that; I am guessing at inches, in distances.

X-Q. 709. Of course, I want you to tell only what you can swear to.

A. I am telling you what I can not swear to.

X-Q. 710. You can not swear it wasn't practically flush with the edge of the bench?

A. The machine was mounted, as far as my recollection serves me, as it was mounted in the early days when first built.

X-Q. 711. Did you tell Mr. Howe how it was mounted?

A. I don't recollect that.

X-Q. 712. You don't recollect that either?

A. No.

X-Q. 713. Your memory about what you told Mr. Howe is very poor?

A. It is.

X-Q. 714. Very poor.

A. Yes, sir.

X-Q. 715. Surprisingly poor.

A. No, not necessarily.

X-Q. 716. Because you knew all the facts in 1913.

A. Not all of them.

X-Q. 717. What facts did you find out since?

A. I can not say that definitely.

X-Q. 718. Tell us what facts you found out since.

A. What particular facts do you want to know?

X-Q. 719. What you did with that machine.

A. Which particular one? Be specific.

X-Q. 720. About the spot welding, all the facts about your method of spot welding that you found out since 1913.

A. That is difficult to say, because I don't know just exactly what I knew in 1913 with reference to what I know now.

X-Q. 721. What have been your additional sources of information as to your work in 1901 which you have had since 1913?

A. Well, in my conversations with operators that worked with that machine, and worked in the same plant, looking over the lay of the building, and referring to different things that were done.

X-Q. 722. Talking with operators and referring to the lay of the building?

A. Yes, sir.

X-Q. 723. What other specific thing?

A. Referring to the work that was done.

X-Q. 724. Spot welding?

X-Q. 725. That machine did weld or produce the guards?

A. Yes, sir.

X-Q. 726. The operators told you they had produced guards—spot welded guards? Is that what they told you?

A. I knew they produced guards.

X-Q. 727. That was not a new fact then?

A. No.

X-Q. 728. What other new facts did the operators tell you?

A. That is difficult to say.

X-Q. 729. Did they tell you that they had seen you do spot welding?

A. These operators told me that—had not told me that before, you mean?

X-Q. 730. Yes.

A. My impression is they did tell me that they had seen me do spot welding.

X-Q. 731. Which ones? Name them.

A. Now, that is a difficult thing to do. I think—well, I can not say either with reference to any particular operator, who has told me he has seen me do spot welding, that told me since 1913 or had not told me that before.

X-Q. 732. What do you mean? What do you mean by operators?

A. Men that worked in the factory.

X-Q. 733. You don't mean operators on this machine?

A. No.

X-Q. 734. You don't restrict it to that?

A. No.

X-Q. 735. Who were the operators on this machine in 1901?

A. That is difficult to say. I personally was not in close contact with the men in the shop any more than with some few that were either heads of departments or men that had been with us for some length of time.

X-Q. 736. Name them the best you can.

A. The operators that I am familiar with, these men that worked in the factory, were such men as Jasper Powers, John Gilder, John McDonald, William E. Smith, Mr. Craft, and there may be others.

X-Q. 737. Let me make a note of who those operators were in the factory—I mean on this machine—

A. No, you asked me who was working in the shop.

X-Q. 738. No, I asked you about this machine. Whatever I asked you, answer this question: What operators operated this 1901 machine you have got here in the year 1901?

A. I don't know as I could identify a single one.

X-Q. 739. You would not swear to any one, you mean?

A. I would not say I could.

X-Q. 740. And yet you were there all the time?

A. I was in the factory.

X-Q. 741. Were you experimenting with this machine?

A. Not much; it was a pretty good sized factory and I had entire charge of it.

X-Q. 742. But you don't know what men were making butt welds on this machine?

A. No.

X-Q. 743. During 1901?

A. No, sir. I may have known them at the time.

X-Q. 744. Did you ever tell Mr. Howe what men were operating this machine in 1901?

A. I don't know as I did. I would want to ask the men who worked there whether they operated it and take their word for it.

X-Q. 745. Do you know now whether copper or iron melts at a lower temperature?

A. Copper melts at a lower temperature than iron.

X-Q. 746. Did you know that in 1901?

A. Yes, I think I did; I would not say definitely I did though.

X-Q. 747. That is almost schoolboy's knowledge to an engineer and designer of machinery?

A. It might be now. I don't know as it was then. I was a machinist in those days.

X-Q. 748. Now, coming back to the early days of this machine, you bought it in 1911, and you bought the transformer with it?

A. Yes, sir.

X-Q. 749. And the two were disconnected, but both in the same tool room?

A. Both were in the same pile of scrap.

X-Q. 750. What?

A. I say both were in the same scrap pile.

X-Q. 751. The transformer was scrapped?

A. It had been laid aside to be scrapped.

X-Q. 752. And this is the very transformer?

A. Yes, sir.

X-Q. 753. And you are able to recognize it?

A. Yes, sir.

X-Q. 754. Now, how do you recognize it? Why should it not be another one?

A. Well, due to the peculiar construction of it.

X-Q. 755. What peculiar construction?

A. The way the square turns are put on the coils.

X-Q. 756. What is peculiar about that?

A. The way they are drawn around in place and held in position.

X-Q. 757. What is peculiar about that?

A. The construction of it. That is all I can say; the particular shape of it. I could possibly make you a drawing and illustrate what I mean but that is all I can say.

X-Q. 758. That is all you can say?

A. I never saw another transformer of that type, the plate in that way.

X-Q. 759. And you say there are four turns on the secondary, and how many convolutions of wire are there?

A. I don't know, unless I count them.

X-Q. 760. You don't remember how many there were, but you remember it was peculiar?

A. Yes, sir.

X-Q. 761. The appearance?

A. Yes, sir.

X-Q. 762. And in the connection?

A. No, there was nothing peculiar about the connection. They are connected in series, the standard connections.

X-Q. 763. Now, the 500 turns on the primary of each leg, or do you mean two legs added together?

A. The record says 500 turns on the primary coil.

X-Q. 764. What does that mean? on each leg?

A. That means 500 turns, and it may be 500 turns on each coil, or 500 all told. I am not in a position to say. I had nothing to do with the winding of it. I have my own opinion about it.

X-Q. 765. What is that opinion?

A. That there was 500 turns on each leg, and they are connected in parallels

X-Q. 766. As a man conversant with the transformer business, would that be the natural way of doing it, the right way of doing it?

A. That would be the way I would build that type of transformer.

X-Q. 767. Now when did you actually use this welder after 1911, either for butt welding or spot welding?

A. I don't know. I would not want to make any definite statement on that.

X-Q. 768. Well, I think you ought to remember that.

A. Why?

X-Q. 769. Well, it is not back far. How about 1911?

A. There was a lot of other things I was doing in those days.

X-Q. 770. Can't you tell me when you first made use of this machine after 1911?

A. No.

X-Q. 771. When did you first hitch it up to the transformer after 1911?

A. I would not want to make a definite statement on that.

X-Q. 772. Can't you tell me the year?

A. No, I won't say whether I did or did not hitch it up as soon as I got it, to find out whether it was electrically all right. I might or might not.

X-Q. 773. Do you recall it?

A. No, I don't.

X-Q. 774. But you do recall taking it to the National Company's works in 1911, and you do recall using it in 1917. You do recall about using it for welding, hitched up with this transformer in 1917, do you?

A. I recall using it, but I would not want to tie myself down to 1917.

(The Court: Was it in 1917?)

(The Witness: I would not say that definitely, somewhere about that time. The machine was there, and the actual time does not stick in my memory. I have nothing to identify that date.)

X-Q. 775. Now if you had not that exhibit with the date marked on it, how would you fix February, 1901, as the date you did spot welding?

A. If I was going to fix the date irrespective of that, I would

have said it was very shortly after we got the little machine in operation.

X-Q. 776. And that date also you fix by the date in the transformer book?

A. Yes.

X-Q. 777. What other circumstances?

A. The fact we had men working there that also had a recollection.

X-Q. 778. I mean of your own recollection.

A. Then the fact of the purchases along that time would indicate that also, purchases of stock.

X-Q. 779. That would be in February, too?

A. Not necessarily, but somewhere very close to that time.

X-Q. 780. How does this happen to be cut off, the top of this Exhibit M?

A. That would indicate that either I wanted a piece of material of that kind for some use in the early days, or possibly—

X-Q. 781. It strikes me as rather funny to cut off a piece of specimen you highly prize, because you could not find another piece of metal of that kind.

A. No, the prize specimen is all there; some excess of metal is of no particular advantage.

X-Q. 782. And you wanted a little piece of metal and you just cut that piece off instead of picking a piece up from the floor or table? Is that it?

A. Sometimes you can not pick up these pieces.

X-Q. 783. When was the top of that cut off?

A. I am not in position to say.

X-Q. 784. How long was it in your tool box after you put it there in 1901?

A. It must have been in my tool box until some time along in 1911 or 1912.

X-Q. 785. Why do you say 1911 or 1912?

A. It was along about that time; I can not identify the actual date that it was dug up in there. That is, that we found it desirable to have that sample for information, but it was there all that time.

X-Q. 786. What occurred in 1911 or 1912 that made you take this out of the tool box?

A. The matter—other information came up in connection with the subject of electric spot welding.

X-Q. 787. But you got it out for Mr. Howe?

A. I don't remember whether I got it out for Mr. Howe or some one else.

X-Q. 788. Well, who else?

A. Well, there was Mr. J. Nota McGill and Mr. White of the General Fireproofing Company of Youngstown.

X-Q. 789. He was also interested in the same proposition?

A. Yes, sir.

X-Q. 790. And it all came along about the same time as the Barney & Berry suit?

A. I would not say. I think not. I think this matter had been brought to my attention with reference to some litigation earlier than that. There had been other litigation with reference to spot welding.

X-Q. 791. Did you show this to Mr. Howe?

A. I think not.

X-Q. 792. Did you have it at that time?

A. I think I did.

X-Q. 793. Why didn't you show it to Mr. Howe?

A. I had definite instructions to keep that thing to myself.

X-Q. 794. Who told you that?

A. Mr. White of the General Fireproofing Company.

X-Q. 795. So you kept this thing absolutely under your own hat?

A. Absolutely under my own hat.

X-Q. 796. And you put the date on it under your own hat, so to speak, without telling anybody about it?

A. No; that date is on there. I don't know as there is any particular secret about that. That was there.

X-Q. 797. Did anybody else say to you to put that date on? Of course, that might have been done yesterday or the day before.

A. It might have been.

X-Q. 798. You say it might have been done yesterday or the day before?

A. Yes, sir.

X-Q. 799. Why do you say that?

A. Because it is not a difficult thing to put a date mark on a thing of that kind.

X-Q. 800. It bruises the metal to put a stamp on in that way?

A. Yes, sir, unless you put it on something smooth.

X-Q. 801. What steps did you take to prevent rust from collecting?

A. Not any.

X-Q. 802. Has it rusted any since that year?

A. I can not tell.

X-Q. 803. No rust has collected on it for 17 years?

A. There isn't any rust on any tools in my tool box.

X-Q. 804. But you use the tools in your tool box?

A. No.

X-Q. 805. You do not use the tools?

A. No, they lay there.

X-Q. 806. Isn't that a remarkably bright specimen for 17 years old?

A. No.

X-Q. 807. No rust on it at all?

A. I don't say there is no rust on it, but I noticed it yesterday, and there was apparently no rust on it.

X-Q. 808. You kept it in your tool box all that time?

A. Yes, sir.

X-Q. 809. Was it wrapped up?

A. No, sir.

X-Q. 810. Just loose?

A. Just loose in the bottom of the box.

X-Q. 811. Loose in the bottom of the box?

A. Yes, sir.

X-Q. 812. Other tools on top of it?

A. Yes, sir.

X-Q. 813. The other tools on top might have scratched it?

A. Might have.

X-Q. 814. But didn't?

A. Apparently not.

X-Q. 815. That was lucky. Now you said this had two blades welded on it?

A. It had a complete center, with another blade on it.

X-Q. 816. And that blade was given to whom?

A. J. Nota McGill.

X-Q. 817. What is the date of that?

A. No date on it that I know of.

X-Q. 818. No date on the other center?

A. I think not.

X-Q. 819. Did you tell him about this piece when you told him about the other?

A. He saw that. I don't remember whether I told him anything about it or not.

X-Q. 820. Did you tell him what those figures meant "2-15-01"?

A. I would not say anything definitely about that.

X-Q. 821. Do you think he could understand those figures if he saw them?

A. Yes, I believe he could.

X-Q. 822. But you concealed this from Mr. Howe?

A. I did.

X-Q. 823. Purposely?

A. Yes, sir.

X-Q. 824. Why was that?

A. On direct instructions we should keep that sample to ourselves, because any sample which was the last sample we had, and our only marking or identification, if it got out of our hands, we were done for, so far as that is concerned.

X-Q. 825. Did you mark any other samples on that date?

A. Not to my knowledge.

X-Q. 826. You think this is really the first sample you made?

A. No, I would not say it is.

X-Q. 827. Was this sample made with bent-up electrodes, or with straight electrodes?

A. No, that was made with straight electrodes. You could not apply much pressure with bent-up electrodes.

X-Q. 828. And in making your spot welds, that you say you made in 1901, did you operate the clamps in the same way that the workman operated the clamps when he was doing the spot welding?

A. We did at that time.

X-Q. 829. And that operation consisted of taking hold of the levers and moving them, moving the parts toward one another?

A. Moving the movable jaws toward each other.

X-Q. 830. Moved both jaws?

A. They can move both jaws or one jaw.

X-Q. 831. How did you do it?

A. I could not say definitely.

X-Q. 832. Do you remember how the workman did it?

A. In making butt welds?

X-Q. 833. Yes.

A. No, I don't. That was entirely up to the workman.

X-Q. 834. What other person besides yourself made spot welds on this machine in 1901?

A. I think Mr. Jasper Powers did, and I don't know, I think Captain William Smith did. I don't believe Mr. Gilder did. And I think Mr. E. C. Lipps did.

X-Q. 835. Anybody else?

A. Not that I can recollect.

X-Q. 836. Will you swear that those men made those welds in any other month than February, 1901?

A. I will not.

X-Q. 837. And were those men operating the machine to make spot welds in the ordinary operation the way the machine was being used regularly?

A. That is what this would do; I would imagine it would be done in the regular process. I don't imagine they welded any fan blades.

X-Q. 838. They might have made some samples? Is that the idea?

A. They might have made samples, picked up the materials and spot welded them together.

X-Q. 839. Did you tell Mr. Howe who did that work?

A. I don't remember as to that.

X-Q. 840. When Mr. Howe came to see you, did you willingly conceal from him information about your work in 1901?

A. I did.

X-Q. 841. You willingly concealed it?

A. Yes, sir, I willfully concealed the fact that we had that sample.

X-Q. 842. Anything else that you willfully concealed from him?

A. Not to my knowledge.

X-Q. 843. You laid yourself open frankly and told him the whole story?

A. I told him just what the situation was.

X-Q. 844. And practically the same story you told today and yesterday on the witness stand?

A. Yes, sir.

X-Q. 845. Because you recollect some things better now than you did then?

A. The chances are I did, and the chances are I recall less. It is a long time between 1913 and 1919, and there are a lot of things that happened in the meantime.

X-Q. 846. I appreciate that.

Court then adjourned to 9:30 A. M. next day.

Wednesday, May 21st, 1919, 9:30 A. M.

(Mr. Stackpole: The plaintiff introduces and asks to be filed the depositions taken out of court on behalf of plaintiff, viz., the depositions of James H. Gravell, George W. Knapp, William A. Herring, Charles F. Tischner, Charles H. Schwing, Charles J. Timms, William B. Heron, Sol Richmand, Robert W. Clark, Herman Lemp, the second deposition of George W. Knapp, the second deposition of William A. Herring, and George W. Knapp, Jr.)

We introduce also the following exhibits which have been offered in connection with those depositions, and the interrogatories already filed in the court.

Plaintiff's Exhibit No. 1, picture of defendant's welder attached to interrogatories.

Exhibit No. 2, spot welded tube attached to interrogatories.

Exhibit No. 3, copy of certificate of incorporation of electric welder company.

Exhibit No. 4, certificate of change in name of electric welder company to Thomson Electric Welder Company.

Exhibit No. 5, Harmatta patent in suit.

Exhibit No. 6, title papers of Harmatta patent in suit.

Exhibit No. 7, Gravell specimen of Ford welding.

Exhibit No. 8, drawings of machine body acquired by the National Company from Silesia for A. B. C.

Exhibit No. 9, Thomson spot Welder bulletin.

Exhibit No. 10 A and 10 B, sample electrode of plaintiff's spot welding machine.

Exhibit No. 11, list of licensed spot welder machine.

Exhibit No. 12, plaintiff's translation of German patent to Benardos, No. 50,909.

Exhibit No. 13, chart showing comparison of Harmatta's patent No. 1,046,066 with the previous art.

Exhibit No. 14, Harmatta assignment.

Exhibit No. 15, copy of Silesia Thomson contract.

Exhibit No. 16, Silesia agreement with the National Enameling Company, December 3, 1904.

Exhibit No. 17, Heron memorandum book.

Exhibit No. 18, specimen of spot welding prepared by Clark.

Exhibit No. 19, de Ferranti patent No. 906,400.

The other exhibits have been offered during this hearing, your Honor.

(Mr. Church: May I make a similar offer of the defendant's exhibits?)

Defendant offers in evidence the stipulation in regard to copies of defendant's taking of depositions under Section 863 R. S. U. S.; the following depositions that are printed in Volume I of defendant's printed record, designated as follows:

Deposition of William E. Smith;

Deposition of Elihu Thomson;

Deposition of Frank L. Dyer;

Deposition of Charles F. Tischner;

Deposition of Henry C. Townsend;

Deposition of Adolph F. Reitzel;

Stipulation introducing certain depositions and exhibits in Thomson Spot Welder Co. v. Houghton & Dutton, et al., into Thomson Spot Welder Co. v. Ford Motor Co.

Deposition of John B. Estabrook;

Deposition of Pearl M. Long;

Deposition of George B. Sawyer;

Deposition of Charles B. McCurdy;

Deposition of Fred W. Roberts;

Deposition of Howard A. Coombs;

Deposition of William Friess;

Also, the following defendant's exhibits, printed in Volume II of defendant's record, and designated as follows:

Exhibit No. 1, U. S. Patent to Thomson No. 347,140;

Exhibit No. 2, U. S. Patent to Thomson No. 347,141;

Exhibit No. 3, U. S. Patent to Benardos No. 363,320;

Exhibit No. 4, U. S. Patent to Thomson No. 396,015;

Exhibit No. 5, U. S. Patent to Dewey No. 432,727;

Exhibit No. 6, U. S. Patent to Coffin No. 437,571;

Exhibit No. 7, U. S. Patent to Thomson No. 444,928;

Exhibit No. 8, U. S. Patent to Blanchard No. 466,266;

Exhibit No. 9, U. S. Patent to Thomson No. 496,019;

Exhibit No. 10, U. S. Patent to Lemp No. 531,197;

Exhibit No. 11, U. S. Patent to Lemp No. 553,923;

Exhibit No. 12, U. S. Patent to Robinson No. 574,942;

Exhibit No. 13, U. S. Patent to Kleinschmidt No. 616,436;

Exhibit No. 14, U. S. Patent to Burton No. 647,694;

Exhibit No. 15, U. S. Patent to Perry No. 670,808;

Exhibits.

Exhibit No. 16, U. S. Patent to Hunter No. 690,958;
Exhibit No. 17, U. S. Patent to de Ferranti No. 874,398;
Exhibit No. 18, U. S. Patent to Rietzel No. 928,701;
Exhibit No. 19, U. S. Patent to de Ferranti No. 1,148,221;
Exhibit No. 20, Certified Copy of British patent to Parkinson No. 14,536 of 1894;

Exhibit No. 21, Certified Copy of British patent to de Ferranti No. 11,921 of 1903;

Exhibit No. 22, Certified Copy of British patent to Harmatta No. 22,981 of 1903;

Exhibit No. 23, Certified Copy of French patent to Egel No. 335,889;

Exhibit No. 24, Translation of French patent to Egel No. 335,889;

Exhibit No. 25, Certified Copy of French patent to Egel No. 336,187;

Exhibit No. 26, Translation of French patent to Egel No. 336,187;

Exhibit No. 27, Certified Copy of German patent to Benardos No. 50,909;

Exhibit No. 28, Translation of German patent to Benardos No. 50,909;

Exhibit No. 29, Copy of Harmatta U. S. application as filed December 3, 1903;

Exhibit No. 30, Certified Copy of file wrapper and contents of de Ferranti U. S. patent No. 1,148,221;

Exhibit No. 31, Certified Copy of file wrapper and contents of de Ferranti U. S. application Serial No. 688,464;

Exhibit No. 32, Certified Copy of file wrapper and contents of Harmatta U. S. patent No. 1,046,066;

Exhibit No. 33, Certified Copy of file wrapper and contents of Interference No. 36,709, de Ferranti vs. Harmatta.

Also, the following exhibits, printed in Volume III of defendant's record:

Exhibit No. 34, Certified Copy of file wrapper and contents of Rietzel U. S. patent No. 928,701;

Exhibit No. 35, Certified Copy of file wrapper and contents of Interference No. 31,792, Rietzel v. Harmatta;

Exhibit No. 36, Certified Copy of assignment of Harmatta application from Harmatta to Thomson Electric Welding Company;

Exhibit No. 37, Certified Copy of assignment of Rietzel application from Rietzel to Thomson Electric Welding Company, of Maine;

Exhibit No. 38, Certified Copy of assignment of Thomson Electric Welding Co. of Maine of all its assets, to Thomson Electric Welding Co. of Mass.;

Exhibit No. 39, Certified Copy of assignment of Rietzel patent from Thomson Electric Welding Co. of Maine to

Thomson Electric Welding Co. of Mass.;

Exhibit No. 40, Certified Copy of assignment of Harmatta patent and Rietzel patent from Thomson Electric Welding Co. to Thompson Spot Welder Co.

Exhibit No. 41, Certified Copy of assignment of de Ferranti application from de Ferranti to F. L. Middleton;

Exhibit No. 42, Certified Copy of assignment of de Ferranti application from F. L. Middleton to Melville Church;

Exhibit No. 43, Certified Copy of assignment of de Ferranti application from Melville Church to H. C. Milligan, trustee;

Exhibit No. 44, Original license from H. C. Milligan, trustee, to Ford Motor Co., under de Ferranti application;

Exhibit No. 45, Certified Copy of decree on mandate in Thomson Electric Welding Co., et al., vs. Barney & Berry, Inc., under Harmatta patent;

Exhibit No. 46, Certified Copy of record in Thomson Electric Welding Co., et al., vs. National Enameling & Stamping Co.;

Exhibit No. 47, Certified Copy of docket entries in Thomson Electric Welding Co. et al., vs. U. S. Metal Products Co.;

Exhibit No. 48, Copy of pleadings in Thomson Electric Welding Co. v. U. S. Metal Products Co.;

Exhibit No. 49, Dyer Photographs A-1 to A-6 (not reproduced);

Exhibit No. 50, Dyer Photographs B-1 to B-14 (not reproduced);

Exhibit No. 51, Dyer Photographs C-1 to C-8 (not reproduced);

Defendant's Exhibit Agreement of August 3, 1912, between Thomson Elec. Weld Co. and American Elec. Weld Co.;

Defendant's Exhibit Agreement of June 10, 1914, between Thomson Elec. Weld Co. and American Elec. Weld Co.;

Defendant's Exhibit, Tilghman Correspondence;

Defendant's Exhibit, Rietzel Sketch.

To which are to be added: As Exhibit No. 52, Certified Copy of Harmatta Canadian application of December 1st, 1903, No. 108,990;

As Exhibit No. 53, Copy of Rietzel patent No. 1,041,351, dated October 15, 1912.

(Mr. Stackpole: I forgot to mention, your Honor, we have already filed and ask to be accepted by the Court interrogatories of the defendant and the answers to certain stipulations which are contained in each deposition. I cannot remember all of them.)

(The Court: They are in.)

F. P. McBerty.

(Mr. Stackpole: With Mr. Church's consent, I will ask your Honor to make an order that the exhibits that are now in this case remain in the custody of the Clerk from now on, and shall not be withdrawn without the consent of the Court or consent of counsel on both sides.)

(The Court: Any objection to that?)

(Mr. Church: No objection.)

(The Court: Very well; I will give that order.)

F. P. McBERTY.

F. P. McBERTY, recalled for further cross-examination, testified as follows:

Examined by MR. STACKPOLE:

X-Q. 847. You have referred many times to the National Electric Welder Company; is that a company or partnership?

A. That is a company, a corporation.

X-Q. 848. Where are the factories or stores of that company?

A. It was in Warren, Ohio.

X-Q. 849. What was the company capitalized for?

A. \$25,000, I think, originally, and later, increased to \$75,000.

X-Q. 850. By "later" you mean what year?

A. I don't believe I can recollect the date; I would not want to make a definite statement whether that is the actual condition or not. It was capitalized at \$75,000 when I discontinued my connection with it.

X-Q. 851. How much of the stock did you hold?

A. I held 25%.

X-Q. 852. How much did Mr. Wolcott hold?

A. He and his wife held 50%.

X-Q. 853. And you and your wife owned what per cent?

A. The other half.

X-Q. 854. So you and your wife owned half of the company?

A. Yes, sir.

X-Q. 855. Did the company ever pay any dividends?

A. No, I don't think it ever did.

X-Q. 856. What was your office in that company?

A. I was nominally known as secretary and treasurer.

X-Q. 857. General manager also?

A. Yes, sir.

X-Q. 858. You practically had charge of the entire operations, did you?

A. I had charge of the manufacturing end of it, not the selling.

X-Q. 859. And the financial end?

A. I didn't devote my attention to the financial end of it.

X-Q. 860. But you and your wife had a half interest in the company?

A. Yes, sir.

X-Q. 861. It was really a partnership between you and Mr. Wolcott, half and half?

A. Well, it would be.

X-Q. 862. Under corporate form?

A. Under corporate form, yes, sir.

X-Q. 863. How big is the building of the National Electric Welder Company?

A. The building was 80 x 200 feet.

X-Q. 864. And of what material?

A. Steel, glass, brick and wood.

X-Q. 865. What was it taxed for in 1917?

A. That is a matter I could not state myself at all.

X-Q. 866. You were treasurer at that time?

A. Yes, I was treasurer. Mrs. McBerty took care of all those affairs.

X-Q. 867. Did you pay the tax bill?

A. Mrs. McBerty attended to that.

X-Q. 868. Can't you remember whether it was taxed for over \$25,000 at that time?

A. No, I could not really make a definite statement. I had nothing to do with the payment of the taxes.

X-Q. 869. What was your salary as treasurer, secretary, and general manager of the National Company?

(The Court: The National Company?)

(Mr. Stackpole: Yes, your Honor.)

(The Witness: It was, I think, \$150 a month.)

X-Q. 870. That would be \$1,800 a year?

A. Yes, sir.

X-Q. 871. Was that your salary in 1917?

A. Now, that is a question I would not want to answer definitely, without referring to our books.

X-Q. 872. Was it materially increased?

A. I don't remember, as it was materially increased.

X-Q. 873. That was about it?

A. Somewhere in that neighborhood.

X-Q. 874. To whom did the National Company sell its plant?

A. Sold its plant to what is known as the Federal Machine Welding Company.

X-Q. 875. Are you employed by that company now?

A. Yes, sir.

X-Q. 876. What salary are you getting?

A. I get \$750 a month.

X-Q. 877. When was that sale made?

A. In September, 1917, I think.

X-Q. 878. And the Federal Company bought the property of the National Company?

A. The physical assets of the National Electric Welder Company.

X-Q. 879. And you are now in what position in the Federal Company?

A. As general manager.

X-Q. 880. Any other member of your family employed by the Federal Company?

A. Mrs. McBerty.

X-Q. 881. Mrs. McBerty. How much does she get?

A. She gets \$350 a month.

X-Q. 882. What is her position?

A. Secretary and treasurer.

X-Q. 883. Does the Federal Company manufacture welding machines?

A. Yes, sir.

X-Q. 884. And sells them?

A. Yes, sir.

X-Q. 885. Put them out on lease?

A. No, sir.

X-Q. 886. Sells them?

A. Sells them outright.

X-Q. 887. How large a business did the Federal Company do in 1918 in spot welding machines?

(Objected to.)

(The Court: I don't know how this is material.)

(Mr. Stackpole: It shows his interest.)

(Mr. Church: There is a suit pending in Cleveland between the Thomson Electric Welding Company and the National Company, and I think this is for the purpose of using this information in that suit.)

(Mr. Stackpole: Not at all, your Honor.)

(The Court: It is not on the line of the direct examination at all.)

(Mr. Church: I object as not proper cross-examination.)

(The Court: Until I know more about it, I will sustain the objection.)

(Mr. Stackpole: It bears on the interest of the witness in the testimony he has given and the result of this case——)

(The Court: In what way?)

(Mr. Stackpole: Being employed by the Federal Company, he is interested in the result, whether or not the Harmatta patent is sustained as part of the business of the Federal Company, and for the whole business of the Federal Company in manufacturing——)

(The Court: Is the subject matter of the suit in Cleveland the subject matter of this suit?)

(Mr. Stackpole: No, your Honor, is is not.)

(Mr. Church: It is a suit for damages against Mr. McBerty and others.)

(The Court: So far as interest is concerned, it seems to me you have gone as far as the Court ought to permit you to go, showing there is some adverse interest between the witness and the plaintiff, but the exact details of it you certainly ought not to spend time on.)

(Mr. Stackpole: Very well, your Honor. I just wanted to bring out the main facts; that is all.)

X-Q. 888. In the experiments made yesterday at the plant of the Ford Company, how rapidly were the spot welds made? That is to say, how long was the current on in making the spot welds?

A. I would roughly estimate that as one and one-half seconds or two seconds.

X-Q. 889. And in your attempts to butt weld, how long was the current on?

A. I should say that was less than a second.

X-Q. Very quick?

A. Yes, sir.

X-Q. 891. And in welding the blades to the spiders, you were demonstrating the exact reproduction of what you say you did in 1901?

A. As nearly as I could.

X-Q. 892. And spider blades the same thing?

A. Practically the same, yes, sir.

X-Q. 893. And the machine was in the same condition as it was from the beginning, as far as the transformer is concerned?

A. Yes, sir, I should say it was.

X-Q. 894. Now, in the factory of the Warren Electric and Specialty Company, after the blades had been riveted to the spiders in

the manufacture of these fans, what was the next step in the process of completing the fans?

A. The blade would be mounted on the hub.

X-Q. 895. Would it be pinned to another arm for that purpose?

A. Yes, it would. Ordinarily, it would.

X-Q. 896. And the fans would be taken in lots, I suppose, to the other room?

A. In tray fulls, yes, sir.

X-Q. 897. And the operator would then put the fan on the hub?

A. Yes, sir.

X-Q. 898. When did the japanning occur?

A. The japanning occurred after the blades had been given the proper pitch and the proper balance.

X-Q. 899. How many coats of japan?

A. I would not make a definite statement, but my impression is two coats of japan, depending upon the type of finish they were given.

X-Q. 900. How long would it take to do the drying?

A. Over night.

X-Q. 901. One day?

A. Yes, sir.

X-Q. 902. How long did it take to assemble the parts in such complete fan?

A. My recollection is a trifle hazy, but I would say one man would assemble 10 or 15 fans a day.

X-Q. 903. And your output that year was 3,000?

A. No, I don't think the entire output—well, it was in excess of 3,000.

X-Q. 904. You don't agree with Captain Smith, who has already testified?

A. I don't know what he testified.

X-Q. 905. Assuming he testified the output was 3,000, you would not agree with him?

A. I don't think I would.

X-Q. 906. How many of this type of fans were made?

A. I would not want to make a definite statement on that.

X-Q. 907. As many as a thousand?

A. I would not say. I don't believe there were.

X-Q. 908. As many as 500?

A. Somewhere in that neighborhood.

(The Court: Were they in two sizes?)

A. Two sizes.

X-Q. 909. Would you say about a thousand, so that we can talk in definite figures?

A. I would say a thousand of both types, all sizes of the types.

X-Q. 910. And that would make 2,000 rings to be welded?

A. Three rings on each.

X-Q. 911. Were there three rings on each fan?

A. Two rings in front, two large ones and one small one.

X-Q. 912. Then there were three rings, one small one and two large ones? That would make three thousand welds?

A. Yes, sir, with that amount of production.

X-Q. 913. And those butt welds would take how long?

A. Each butt weld?

X-Q. 914. No. How long would it take to make the whole 3,000?

A. If a man did nothing but weld those rings, he could readily produce them in two weeks.

X-Q. 915. And if he did nothing but spot weld, as you spot welded this morning, how long would it take him to put the spindles on the blades of those fans?

A. Well, a thousand fans would keep him quite busy at it for a month or six weeks.

X-Q. 916. Do you remember what month of the year 1917 you first saw this 1901 catalog?

A. I have a poor memory for dates; my impression is it was along in the spring of 1917.

X-Q. 917. After the first of April?

A. Well, I would not want to confine myself to days, but it was somewhere about March or April. My method of getting them in my memory is the condition of the weather when I went to the Peerless plant—on that date.

X-Q. 918. Look at page 13 of the 1901 catalog. Come down where you can get a good light, Mr. McBerty. Do you see rivet heads on the blade that sticks up toward the left hand?

A. No, sir; my eyes are none too good.

X-Q. 919. In the upper corner of No. A-5?

A. No, I would not say that I did. No.

X-Q. 920. And in the cut of the A-6 fan, do you see any rivet heads on the blade standing up in the same direction, toward the left hand corner?

A. No, I don't.

X-Q. 921. And in the E-2 fan on page 15, do you see the third rivet head in the blade extending to the right?

A. No, I can not distinguish that one either.

X-Q. 922. And in the E-3 fan on page 16, do you see any rivet heads on the blade extending to the right?

A. No, I can not see any rivets there myself. I can not distinguish any.

X-Q. 923. And in the same cut, how many rivets can you see on the blade that sticks up straight?

A. I can not distinguish any rivets on the blade that runs straight up.

X-Q. 924. The one down there?

A. Yes, sir, when you call my attention to it, I would say there is a rivet down at the bottom of the blade, but that is the only one I can distinguish.

X-Q. 925. After you had received this catalog of 1901, did you show it to Captain Smith?

A. I don't recollect of ever showing that catalog to Mr. Smith at all, personally.

X-Q. 926. Did you show other catalogs to him?

A. I don't recollect that either. I may have.

X-Q. 927. Are there any of these 1901 catalogues in existence, except this one?

A. I was under the impression there were two or three more like it at that time, or one more.

X-Q. 928. Of your own knowledge, do you know that you have ever seen any more?

A. I think we had another one just like that at the factory.

(Mr. Stackpole: If you have any, will you furnish copies, Mr. Church?)

(Mr. Church: I think that is all we have.)

X-Q. 929. And of the 1902 catalog, have you other copies, or no other copies?

A. I don't know.

(Mr. Stackpole: How about that, Mr. Church?)

(Mr. Church: That is the only one I know of.)

X-Q. 930. Where did the 1901 catalog come from, to your own knowledge?

A. That catalog, I think, was taken from—

X-Q. 931. No. Where did it come from, so far as you are concerned?

A. May I look at it, please?

X-Q. 932. Certainly.

A. (Examining catalog. This is the catalog that was turned over to me personally, I believe, by W. C. Wier of the Peerless Electric Company. It has no identification mark, but it is the catalog that he gave to me.

X-Q. 933. Was it in this dilapidated condition when it was given to you?

A. No, it was in good condition when given to me.

X-Q. 934. It looks as if it had been handled a good deal, does it not?

A. Yes, it does.

X-Q. 935. And it was given to you there?

A. At the office of the Peerless Electric Company at Warren.

X-Q. 936. Warren, Ohio?

A. Yes, sir.

X-Q. 937. In 1917?

A. Yes, sir.

X-Q. 938. In the spring?

A. That is my impression, in the spring, yes, sir.

X-Q. 939. And you showed it to Mr. Pattison?

A. Yes, sir.

X-Q. 940. And Mr. Church?

A. I don't remember of showing it to Mr. Church myself.

X-Q. 941. To whom did you show it besides these gentlemen?

A. That is difficult to say. My impression is I turned it over to Mr. Pattison. I don't recollect personally when I called it to anybody's attention after that.

X-Q. 942. Mr. Pattison took it and had charge of it after that?

A. Mr. Pattison, I think, had entire charge of it.

X-Q. 943. Yesterday in operating the machine at the Ford factory, you used a little jig to position the blade on the arm of the spider?

A. Yes, sir.

X-Q. 944. When did you make that jig?

A. I had one of our men make that jig last week.

X-Q. 945. Did you use one like it in 1901?

A. Yes, I believe I did.

X-Q. 946. Are you sure of that?

A. Yes, sir.

X-Q. 947. Absolutely sure?

A. That is the reason I made this particular type of equipment.

X-Q. 948. To take care of the position of the unpunched blade, is that it?

A. That is the only method of locating the blade readily.

X-Q. 949. Did you make the jig yourself in 1901?

A. I would not say whether I did or not.

X-Q. 950. If you did not, do you know who did?

A. No, I don't.

X-Q. 951. Now, coming down to the time when Mr. Howe visited you in 1913, did you show him the machine in the frame as it is now?

A. No, that frame was built in 1917.

X-Q. 952. What time of the year 1917?

A. The spring of the year 1917.

X-Q. 953. For the purpose of connecting the transformer with the welding device?

A. Yes, sir, to illustrate about how it was to be used.

X-Q. 954. And that was done at the factory of the National Company?

A. That was done at the factory of the National Electric Welder Company.

X-Q. 955. Did you ever try welding with any other taps than the ones you used yesterday, the 4½ 0 taps?

A. My impression is that I did, due to the fact we did not have the same voltage called for by the other machine.

X-Q. 956. What was your voltage in the National Company's plant?

A. 220 volts.

X-Q. 957. Did you ever use another transformer with this device?

A. At the National plant?

X-Q. 958. Yes.

A. I don't believe I did.

X-Q. 959. Now, when Mr. Howe called upon you, you explained to him the situation in 1901, I believe, about this machine?

A. Yes, sir.

X-Q. 960. Did you give him any reason why the spot welding of blades to the spiders was not done commercially?

A. My impression is rather hazy on that matter, but the statement as given to Mr. Howe was along the line we were going to duplicate our line of stock and it would add to the cost and was not considered advisable.

X-Q. 961. Did you tell Mr. Howe one of the reasons was that the blades were already punched?

A. I don't definitely recollect that.

X-Q. 962. Did you tell him that the reason the blades were all punched was because there would be no saving in the use of spot welding over rivets? Did you tell him that?

A. I don't definitely recollect that either.

X-Q. 963. Did you also tell him another reason was because that work was in February, 1901, and that was late in the fan season?

A. I might have done that. That would be late in the season.

X-Q. 964. That would be late in the fan season?

A. That would be late in the fan season to start.

X-Q. 965. Did you tell him the reason the rivets were already made and they could see no reason to change?

A. I don't recollect that statement.

X-Q. 966. Did you tell him the rivets had made a good job, and therefore, no reason to change?

A. I don't recollect that statement either, but that would be self-evident.

X-Q. 967. When Mr. Howe came to visit you in 1913, did you introduce him to the other men whom you thought might know about your welding in 1901?

A. I introduced him to some, I know.

X-Q. 968. Did you introduce him to E. C. Lipps?

A. Yes, sir.

X-Q. 969. Did you talk with Mr. Lipps in Mr. Howe's presence?

A. Yes, sir.

X-Q. 970. And discuss what you did in 1901 with him, with Mr. Lipps and Mr. Howe?

A. Yes, sir.

X-Q. 971. And Mr. Lipps told what he remembered to Mr. Howe and to you?

A. Yes, sir.

X-Q. 972. Do you remember Mr. Lipps signing an affidavit?

A. My impression is he did.

X-Q. 973. And the substance of the affidavit was what Mr. Lipps told you and Mr. Howe?

A. Yes, sir, it would be.

X-Q. 974. And the affidavit was prepared by Mr. Howe?

A. Yes, sir.

X-Q. 975. Do you recall reading the affidavit at that time?

A. I believe I did.

X-Q. 976. And agreed with its substance?

A. Yes, sir.

X-Q. 977. Did any of your family assist in preparing these affidavits, in the way of typewriting and so on?

A. I would not want to make a definite statement on that, for the reason these affidavits were prepared in Detroit.

X-Q. 978. In Detroit?

A. Yes, sir.

X-Q. 979. That is, Mr. Lipps' affidavit?

A. Yes, sir.

X-Q. 980. Do you remember of introducing Mr. Howe to a man named Milton W. Bechtel?

A. I don't remember such a name. What was his first name?

X-Q. 981. Milton W. Bechtel.

A. No, that name is not familiar to me at all.

X-Q. 982. Did you introduce Mr. Howe or see him with a man named Austin C. Pendleton?

A. Not that I can remember.

X-Q. 983. Not to your recollection?

A. Not to my recollection.

X-Q. 984. To Oscar C. Tilz?

A. No.

X-Q. 985. Robert J. Manley?

A. No.

X-Q. 986. Was not Robert J. Manley employed by the Warren Company in 1901?

A. Isn't that Mannely?

X-Q. 987. My pronunciation of it is probably at fault.

A. No, I don't recall knowing him at all personally. I don't recollect of seeing him in connection with Mr. Howe at all.

X-Q. 988. Was Mr. Mannely employed there at the plant?

A. I don't recollect that either.

X-Q. 989. Either in 1901 or 1902, while you were there?

A. I don't recollect that. I had nothing to do with the employing of the help at the plant.

X-Q. 990. You were superintendent?

A. I was superintendent.

X-Q. 991. How many men were employed there in the National Company's plant, the Warren Company's plant?

A. It depends upon the time of the year, but I would say on an average of 40 or 50 or 60.

X-Q. 992. And you had general charge of it?

A. Yes, sir.

X-Q. 993. Do you know John W. Gilder?

A. Yes, sir.

X-Q. 994. He was employed there, was he not?

A. Yes, sir.

X-Q. 995. And you took Mr. Howe to see him?

A. I don't remember—I don't know whether I took Mr. Howe to see him, but think I had Mr. Gilder come to see Mr. Howe.

X-Q. 996. And he talked with you and Mr. Howe?

A. Yes, sir.

X-Q. 997. Told what he remembered?

A. Yes, sir.

X-Q. 998. In your presence?

A. Yes, sir.

X-Q. 999. And Mr. Howe prepared his affidavit?

A. Yes, sir.

X-Q. 1000. And Mr. Gilder swore to it?

A. Yes, sir.

X-Q. 1001. And you agreed to its contents?

A. Yes, sir.

X-Q. 1002. You know Walter T. Wakefield?

A. Yes, sir.

X-Q. 1003. What was his position in the company in 1901?

A. I believe Walker T. Wakefield had charge of the fan motor parts.

X-Q. 1004. Do you remember of introducing Mr. Howe to Mr. Wakefield and talking together?

A. No, that does not stick in my recollection.

X-Q. 1005. Did you give Mr. Howe Mr. Wakefield's name as a person who might know these circumstances of 1901?

A. I think I did.

X-Q. 1006. And so far as you know, Mr. Howe went to see Mr. Wakefield?

A. I think so, yes, sir.

X-Q. 1007. Mr. Howe told you so?

A. I don't remember.

X-Q. 1008. Did Mr. Wakefield tell you so?

A. I think Mr. Wakefield told me so.

X-Q. 1009. Mr. Wakefield told you he had given an affidavit to Mr. Howe?

A. I don't believe he did.

X-Q. 1010. He told you he had a talk with Mr. Howe?

A. Yes, sir.

X-Q. 1011. Did he tell you what he told Mr. Howe?

A. I don't think he did.

X-Q. 1012. Were you not enough interested to try to find out?

A. I might have been, but my recollection does not bring that back to me.

X-Q. 1013. Do you know David S. Estabrook?

A. Yes, sir.

X-Q. 1014. Was he employed in the Warren Company's plant?

A. Yes, sir.

X-Q. 1015. In what capacity?

A. I believe, if you mean David S. Estabrook, he was employed in a portion of the fan motor department.

X-Q. 1016. Did you introduce Mr. Howe to David S. Estabrook?

A. I believe I did.

X-Q. 1017. And talked together about these circumstances in 1901?

A. I think so.

X-Q. 1018. Was the substance of Mr. Estabrook's statement put in the affidavit by Mr. Howe?

A. That I would not want to say offhand.

X-Q. 1019. Mr. Howe was there to get affidavits from Mr. Estabrook?

A. Yes, sir, it is presumed he did.

X-Q. 1020. And you agreed with what Mr. Estabrook told Mr. Howe?

A. I did.

X-Q. 1021. He didn't tell him anything new, anything you did not know before?

A. He may have, I would not say that, for if I had known it, I would not have taken him to Mr. Estabrook.

X-Q. 1022. Did you know Robert W. Bean?

A. Yes, sir.

X-Q. 1023. Where was he employed in the year 1901?

A. He was in the machine shop department.

X-Q. 1024. Did you introduce Mr. Howe to him?

A. I believe so.

X-Q. 1025. And talked this matter over with Mr. Howe in his presence?

A. Yes, sir.

X-Q. 1026. Do you remember whether he gave Mr. Howe an affidavit or not?

A. I believe he did.

X-Q. 1027. Did you see the affidavit?

A. I don't recollect that.

X-Q. 1028. But you agreed with what Mr. Bean told Mr. Howe?

A. Yes, sir.

X-Q. 1029. And he gave an accurate statement of the facts at that time?

A. Yes, sir.

X-Q. 1030. Did you know Mr. Alton J. Lewis?

A. I guess that is a man we know as Ally Lewis. Yes, I remember him.

X-Q. 1031. Was he employed by the Warren Company in 1901?

A. Yes, sir.

X-Q. 1032. In what capacity?

A. I believe he was a buffer; I could not say definitely.

X-Q. 1033. Did you introduce Mr. Howe to him?

A. I believe so.

X-Q. 1034. And talked the matter over with him as to the 1901 work?

A. Most likely I did.

X-Q. 1035. Do you remember that he took his affidavit?

A. I have no recollection of that.

X-Q. 1036. But you agreed with Mr. Lewis, with what he said to Mr. Howe?

A. Yes, sir.

X-Q. 1037. You know Mr. Edward Baedeker?

A. Yes, sir.

X-Q. 1038. Where was he employed in 1901?

A. He was punch press man.

X-Q. 1039. For the Warren Company?

A. Yes, sir, for the Warren Company.

X-Q. 1040. Did you introduce Mr. Howe to him?

A. That does not stick in my recollection.

X-Q. 1041. You cannot say you didn't?

A. No.

X-Q. 1042. Did you ever see Mr. Howe and Mr. Baedeker together?

A. I don't recollect that.

X-Q. 1043. Did you give Mr. Howe Mr. Baedeker's name?

A. I think I did, yes, sir.

X-Q. 1044. And you understood he was going to see Mr. Baedeker and get an affidavit from him?

A. I understood he was going to see all the old employees.

X-Q. 1045. And you helped him reach all the employees?

A. I supplied him with the names of what I could.

X-Q. 1046. You gave him the names of all that you thought had any knowledge of the welding operations in 1901?

A. Yes, sir.

X-Q. 1047. You didn't exclude anybody?

A. No, I don't believe I did.

X-Q. 1048. You remember Newton W. Wolcott?

A. Yes, sir.

X-Q. 1049. Where was he employed in 1901?

A. At the Warren Electric Company. I will take that back. I was thinking of him as he now is. I don't believe I know where Mr. Wolcott was. He was, I believe, in Warren at that time.

X-Q. 1050. A young fellow?

A. Yes, sir, reasonably so, or was at that time.

X-Q. 1051. You gave Mr. Howe Mr. Wolcott's name?

A. I don't recollect that.

X-Q. 1052. He was not one of the employees?

A. Not a steady employee. Mr. Wolcott worked either with the Warren or the Peerless, I think, one or two summer vacations.

X-Q. 1053. You may have given his name to Mr. Howe as somebody who worked around the plant in the summer?

A. Yes, sir.

X-Q. 1054. Do you remember Alfred Ulp?

A. Yes, sir.

X-Q. 1055. Where was he employed in 1901?

A. There.

X-Q. 1056. Whereabouts?

A. He was in the machine shop.

X-Q. 1057. You and Mr. Ulp talked the matter over about the circumstances of 1901?

A. I think we did.

X-Q. 1058. And you agreed with what Mr. Ulp said?

A. Yes, sir.

X-Q. 1059. Mr. Ulp gave an affidavit?

A. I would not want to make a definite statement regarding that.

X-Q. 1060. The conversation was for that purpose, was it not?

A. That was the idea.

X-Q. 1061. In fact, it was intended to take affidavits of all these men familiar with that situation in 1901, and which could be presented by Mr. Howe to his firm?

A. Yes, sir.

X-Q. 1062. The idea of getting the exact recollection of what happened at that time from as many men as you could get hold of? That was the idea?

A. Yes, sir, that was the idea.

X-Q. 1063. You know Mr. Charles B. McCurdy?

A. Yes, sir.

X-Q. 1064. Mr. Howe got an affidavit from him, did he not?

A. I don't recollect of seeing Mr. McCurdy's affidavit, but my impression is he did make an affidavit which would have something to do with the transformer, at least.

X-Q. 1065. You and Mr. Howe and Mr. McCurdy talked it over together?

A. Yes, sir.

X-Q. 1066. And you agreed with what Mr. McCurdy said?

A. Yes, sir.

X-Q. 1067. Do you know Rowland Pfile?

A. Yes, I know him.

X-Q. 1068. Where was he employed in 1901?

A. I don't believe I know where Rowland Pfile was employed in 1901.

X-Q. 1069. Did you talk this matter over with Mr. Howe and Mr. Pfile?

A. I don't recollect that part of it.

X-Q. 1070. You think you gave Mr. Howe Mr. Pfile's name?

A. I think possibly I did. Mr. Pfile was employed, I believe, at the Colonial Electric Company at that time.

X-Q. 1071. By "at that time" you mean 1901?

A. Yes, sir.

X-Q. 1072. Do you recall Frank G. Brown?

A. Yes, sir.

X-Q. 1073. Where was he employed in 1901?

A. I believe he was the Packard Motor Car man at Warren.

X-Q. 1074. Did he ever enter your employment, or the employment of the Warren Electric & Specialty Company, about that time?

A. I believe he did.

X-Q. 1075. What time of the year; do you remember?

A. No, I don't recollect that now.

X-Q. 1076. Did Mr. Brown and Mr. Howe talk the history of this welding operation over together?

A. We did.

X-Q. 1077. Do you recollect that Mr. Brown made an affidavit?

A. I think he did.

X-Q. 1078. And you agreed with Mr. Brown, as to what he said in his affidavit?

A. Yes, sir.

X-Q. 1079. Did you read the affidavit?

A. I must have.

X-Q. 1080. Why do you say you must have?

A. Why, if I agreed with it, I did.

X-Q. 1081. At any rate, you agreed with what Mr. Brown told Mr. Howe?

A. Yes, sir.

X-Q. 1082. Did you introduce Mr. Howe to Mr. McDonnell?

A. To John McDonnell?

X-Q. 1083. Yes.

A. I think I did.

X-Q. 1084. Where was Mr. McDonnell employed in the year 1901?

A. He was with the Warren Electric and Specialty Company.

X-Q. 1085. In what capacity?

A. His position at that time was chief inspector and tester.

X-Q. 1086. Testing what?

A. Desk fans.

X-Q. 1087. Did you go with Mr. Howe to see Mr. McDonald?

A. Yes, sir.

X-Q. 1088. Where was he living at that time?

A. Living in the country. It is rather difficult to identify the particular place, but up towards Ellson's Ledge.

X-Q. 1089. A half dozen miles out of Warren?

A. Yes, sir.

X-Q. 1090. Did you talk the situation over with Mr. McDon-

ald and Mr. Howe, about what was done with this welder in 1901?

A. Yes, sir.

X-Q. 1091. And you agreed with what Mr. Howe said?

A. My impression is I did.

X-Q. 1092. What is the first name of Captain Smith?

A. William Smith.

X-Q. 1093. Did you tell Mr. Howe of Mr. William Smith, and introduce him to William Smith at the time of his visit?

A. No, I don't recollect that.

X-Q. 1094. Where was Mr. Smith living at that time, in 1913?

A. I believe he lived in Youngstown. I could not say definitely.

X-Q. 1095. Did you see Mr. William Smith in 1913?

A. I don't recollect that. I may have seen him in 1913, but I don't recollect of seeing him in the presence of Mr. Howe.

X-Q. 1096. You don't know whether Mr. Smith gave an affidavit, do you?

A. No, I don't recall that.

X-Q. 1097. But you do recall giving Mr. Howe Mr. Smith's name?

A. Not definitely. My impression is I did. I named over all the employees I could remember, at the plant.

X-Q. 1098. You remembered Mr. Smith at that time?

A. I might have.

X-Q. 1099. And you might have overlooked it?

A. Yes, sir.

X-Q. 1100. As not knowing much about this welding?

A. My impression is that in 1901 Mr. Smith was a transformer man.

X-Q. 1101. Not knowing much about welding?

A. Whether he was connected with that particular branch or not, I could not say.

X-Q. 1102. You know Mr. Jasper Powers?

A. Yes, sir.

X-Q. 1103. Where was he living in 1913?

A. I believe he lived in Mansfield, Ohio, in 1913.

X-Q. 1104. Where was he employed in 1901?

A. At the plant of the Warren Electric & Specialty Company at Warren.

X-Q. 1105. In what department and what capacity?

A. He was really a machinist at that time, superintendent.

X-Q. 1106. Did you give Mr. Howe Mr. Powers' name?

A. Yes, sir.

X-Q. 1107. As one of the people that would know about this electric welder?

A. Yes, sir.

X-Q. 1108. Tell him where he could be found?

A. Yes, I believe I did.

X-Q. 1109. Did you talk with Mr. Powers and Mr. Howe together?

A. I don't recall of ever meeting Mr. Powers in company with Mr. Howe.

X-Q. 1110. But you told Mr. Howe everybody's name that you thought had any knowledge of this matter in 1901, did you not?

A. I endeavored to do that.

X-Q. 1111. You endeavored to give Mr. Howe all the information you had and could get on the subject?

A. I endeavored to assist him as much as possible.

X-Q. 1112. The only thing you held back was this Exhibit M?

A. Yes, sir.

X-Q. 1113. Did you give Mr. Howe any other specimens?

A. I believe I did.

X-Q. 1114. Do you remember what they were?

A. I don't recollect exactly what we had at that time. My impression is I gave him a small desk fan.

X-Q. 1115. Did you show Mr. Howe your tool box?

A. I believe I did.

X-Q. 1116. Did Mr. Howe look through the tool box?

A. I don't recollect as to that. I would not want to make a definite statement on that.

X-Q. 1117. Just showed him the outside?

A. I don't recollect.

X-Q. 1118. I suppose Mr. Howe was hunting for some definite article to be used as evidence or some documentary evidence, was he not?

A. He would be, yes, sir.

X-Q. 1119. And it would be a nice thing under the circumstances to fix dates

A. Yes, sir.

X-Q. 1120. Did you give Mr. Howe anything that was dated?

A. I don't recollect of giving Mr. Howe anything that was positively dated.

X-Q. 1121. What time in the year 1901 was it decided by the Warren Company to build this cheaper fan, or was it in 1901?

A. In 1900 they decided to produce that cheaper fan. It is difficult to say. This was a matter entirely in the hands of our general manager, E. W. Gillmer, and after he had looked over the previous year's business he would formulate a plan for the following year, and communicate the same to the factory, and he ordinarily would get that information somewhere along in October, November or December.

X-Q. 1122. Do you recollect telling Mr. Howe your decision to make this cheap fan was in the summer or fall of 1900?

A. No, I don't recollect that.

X-Q. 1123. Do you doubt you told him that?

A. No, I don't think so.

X-Q. 1124. You don't think you did?

A. No, I say I don't doubt but what I did.

X-Q. 1125. That being correct?

A. I would say that was correct.

X-Q. 1126. When did you begin making designs for this little welding device that formed part of your 1901 machine?

A. Let me see. I would say in the month of January.

X-Q. 1127. Did you make any drawings?

A. I believe that Mr. E. C. Lipps made a set.

X-Q. 1128. Well, I want to know what you did.

A. That is difficult for me to say. We had a sketch, but whether Lipps made it or I made it, it is rather difficult to say now, but my impression is Mr. Lipps made a sketch and I passed it through the machine shop.

X-Q. 1129. Why did you go to Mr. Lipps about the matter?

A. Mr. Lipps had a mechanical mind and had had a good deal of mechanical experience, and some spare time.

X-Q. 1130. Had he had any experience in electric welding?

A. I believe he had.

X-Q. 1131. And you had not had any?

A. I had not had any at all.

X-Q. 1132. And so you naturally went to Mr. Lipps to help you out?

A. He had the experience and the knowledge, yes, sir.

X-Q. 1133. Did you consult Mr. Craft about your design?

A. Yes, sir.

X-Q. 1134. That was after he went to Freehold?

A. Yes, sir.

X-Q. 1135. And after he had come back, of course?

A. After he had come back.

X-Q. 1136. Did you make any working drawings?

A. No, we didn't do that.

X-Q. 1137. In your talk with Mr. Howe, did you tell him of more than one four-bladed spider that was spot welded, complete?

A. I think I told him we made several.

X-Q. 1138. Whatever you told him was put down in the affidavit?

A. I expect so.

X-Q. 1139. You read the affidavit?

A. Yes, sir.

X-Q. 1140. Did you tell Mr. Howe of any assembled fans with these spot welded spiders and blades?

A. I don't definitely recollect that either.

X-Q. 1141. Did Mr. Howe ask you about that?

A. That I could not say.

X-Q. 1142. Don't you recall that it interested Mr. Howe to know whether these spot welded spiders and fans had gone into commercial use?

A. It would, yes, sir.

X-Q. 1143. But you don't recollect telling him?

A. No.

X-Q. 1144. That was a point you either held back or didn't know about?

A. I didn't know about definitely.

X-Q. 1145. Or didn't know about definitely?

A. Yes, sir.

X-Q. 1146. So you didn't tell him?

A. I would not say I did tell him.

X-Q. 1147. Whatever you told him was the truth, so far as you knew it at that time?

A. So far as I knew it at that time.

X-Q. 1148. Did you tell Mr. Howe that you had ever explained your spot welding on this machine to Mr. Frank G. Brown?

A. Yes, sir.

X-Q. 1149. Did you ever tell him you had explained it to Mr. Estabrook?

A. You mean by explaining it—

X-Q. 1150. That you told him of the spot welding operation.

A. I told him, I think, I had done spot welding on a machine.

X-Q. 1151. You told Mr. Howe you had told Mr. Estabrook about it?

A. Yes, sir.

X-Q. 1152. Did you tell Mr. Howe you had told Mr. Bean about it?

A. That I would say I did do too.

X-Q. 1153. You did?

A. Yes, sir.

X-Q. 1154. Did you tell Mr. Howe you had told Mr. Gilder about it?

A. I don't recollect having told Mr. Gilder about it, or whether I told Mr. Howe he had seen the work that was done.

X-Q. 1155. You told Mr. Howe Mr. Gilder had seen the work that was done?

A. That is my impression.

X-Q. 1156. And he put that in the affidavit?

A. I would not make a definite statement of that, I don't remember.

X-Q. 1157. Do you remember anything about what you told Mr. Howe as to the visit by Mr. Brown to your plant?

A. My impression is I told Mr. Howe Mr. Brown came to our plant, I believe one Sunday, and I told him something about what had been done.

X-Q. 1158. Did you tell Mr. Howe that Mr. Gilder had seen you doing the work of spot welding on this machine in 1901?

A. That I would not say.

X-Q. 1159. Did you tell Mr. Howe Mr. Bean had seen you doing the work of spot welding in 1901?

A. I believe I did.

X-Q. 1160. Did you tell Mr. Howe Mr. Lipps had seen you doing this work in 1901?

A. Yes, sir.

X-Q. 1161. Did you tell Mr. Howe that Mr. McDonald had seen you do any spot welding in 1901?

A. I believe not. I can not say.

X-Q. 1162. Did Mr. McDonald see you do spot welding in 1901?

A. I don't personally recollect that.

X-Q. 1163. Did you tell him Mr. Smith saw you actually spot weld in 1901?

A. I think he did.

X-Q. 1164. Did you tell Mr. Howe that?

A. I think I did.

X-Q. 1165. Did Mr. Powers see you actually do spot welding in 1901?

A. I believe Mr. Powers did.

X-Q. 1166. Did you tell Mr. Howe that?

A. I think so.

X-Q. 1167. Did you tell Mr. Howe of the straight electrodes for spot welding, pointed, as you call them, in 1901?

A. I don't recollect that.

X-Q. 1168. Did you tell him of the bent-up electrodes?

A. I think I did.

X-Q. 1169. Did anybody besides yourself do any spot welding on this machine in 1901?

A. Yes, sir, I believe, if my recollection serves me right, Mr. Smith did; I believe Mr. Powers did; there may have been others. It wasn't a secret. I hadn't close control of the machine, I paid no particular attention to it.

X-Q. 1170. Did you tell Mr. Howe you thought Mr. Smith and Mr. Powers had done spot welding on this machine in 1901?

A. I believe so; I can not be definite.

X-Q. 1171. You should have told him naturally at that time?

A. Yes, if I remembered definitely, I would.

X-Q. 1172. You spoke in your idea of welding the ends of two copper wires of using two sheets of iron or steel between them. Why did you use two sheets?

A. I was endeavoring to get practically the same resistance, which we get between the ends of the wire, to generate sufficient heat to bring the material up to a welding temperature.

X-Q. 1173. The January that you began the drawings for this welding device, that was of 1901, I assume?

A. Yes, sir, that would be the date.

X-Q. 1174. Do you remember of making the following statement in your affidavit:

"In 1900 it was thought that a better business could be done if the company also manufactured a cheaper fan. Up to this time a considerable quantity of brass had been used in the manufacture of the fans, particularly the fan guard was made of brass rods and wire, and other parts were made of brass, and required considerable labor for buffing and finishing in addition to the cost of the brass itself. It was therefore proposed to make the fan guards, and other parts previously

made of brass, of iron and to japan the whole. This was in the summer and fall of 1900 in preparation for the fan season of 1901."

Do you recall making that statement?

A. I don't definitely recollect that, but that is a statement I made.

X-Q. 1175. You mean it is correct?

A. I would consider it correct.

X-Q. 1176. It is correct now?

A. Yes, sir.

X-Q. 1177. And it was correct in 1913?

A. Yes, sir.

X-Q. 1178. Do you recall making this statement:

"Upon his return from Freehold, N. J., Mr. Craft had ideas about electric welding machines, and as a result of conversations with Mr. Craft and my previous consultation with Mr. Lipps, I decided that electric welding would be the best means of securing the ends of the iron fan guards together. I accordingly in the summer or fall of 1900, made a sketch of a proposed welding machine."

Do you recall that statement?

A. No, I don't. I don't definitely recall that.

X-Q. 1179. Is that a correct statement?

A. I would say yes, inasmuch as it refers to the manufacturing to reduce the cost. I would not make a definite statement in regard to the date. I would say that was a little early.

X-Q. 1180. Do you recollect of making the following statement:

It occurred to me that the welding machine could also be used to cheapen these fans by employing it to secure the fan blades to the center arm by a number of spots which would take the place of the rivets which were previously employed. This was the only fan construction, or in fact any construction, which was employed by the company to which this character of weld was adaptable. In demonstrating the practicability of this idea, I took one of the steel fan blades and centers and welded the blades to the center arm, each blade being secured to the arm by a number of welds in different spots.

Do you recollect that statement?

A. No, that does not definitely stay in my memory, but that would be a statement I would make.

X-Q. 1181. Is that statement substantially correct?

A. Yes, sir.

X-Q. 1182. Correct now?

A. Yes, sir.

X-Q. 1183. Correct in 1913?

A. I would say yes, sir.

X-Q. 1184. Do you recollect the following statement:

The question of adopting the spot welding in place of the riveting on the cheaper fans was seriously considered and would have been adopted except that the fan blades and centers, which we already had in stock, had been punched for the rivets and it made a somewhat botched job to leave the rivet holes open and secure the blades to the spiders by spot welding. Furthermore, inasmuch as the punching had already been done there was no saving in spot welding over the riveting. Furthermore, the tools and jigs for riveting were already made and a different set of jigs to perform the spot welding rapidly would have required a further expenditure. Moreover, this was in the month of February, which was well along in the fan season, so that it was impracticable to make a change over for that season so that it could only have been availed of for the next year. Furthermore, the riveted fans proved satisfactory and as they already had the tools and standard stock for building these fans, it was not thought advisable to provide a second set of apparatus and a duplicate set of unpunched stock for the spot welding of the cheaper fans.

Do you recall that statement?

A. I think I do.

X-Q. 1185. Correct now?

A. Yes, sir.

X-Q. 1186. Correct in 1913?

A. Yes, sir.

X-Q. 1187. An accurate description of the situation?

A. Very close to it.

X-Q. 1188. You have no exceptions to take to it?

A. No.

X-Q. 1189. Do you recall the following statement:

"The machine remained in use as a butt welder by the Peerless Company after its organization, first at the works of the Warren Electric & Specialty Co., and it was later moved to the works of the Peerless Company when they were constructed in 1902, and was in use there up to three or four years ago. There was no work that we could use spot welding on advantageously, which accounts for the use of the machine for butt only in the regular commercial work."

Did you make that statement? And is it substantially correct?

A. That is a correct statement.

X-Q. 1190. Do you recall making it in connection with your affidavit?

A. No, I don't definitely recall it in connection with the affidavit.

X-Q. 1191. Do you recall the following statement:

"I distinctly remember that at that time the space between the clamp arms 3 and 4 was not sufficiently deep to permit the sheets to be welded together to extend sufficiently low-down when placed between the electrodes 31 and 32, when these electrodes were straight, and so we bent the ends of these electrodes upwardly so as to allow the sheets of metal to enter between the electrodes to a sufficient extent to place the weld at the spot desired."

Do you recall making that statement?

A. I recall making that statement in connection with an affidavit, but I don't recall that particular affidavit.

X-Q. 1192. That statement is correct?

A. Yes, sir.

X-Q. 1193. And also was correct in 1913?

A. Yes, sir.

X-Q. 1194. Do you recall the following statement:

"In the original machine the base plate was made in two pieces 1 and 2 which were separated by a piece of fibre, to insulate them, which extended substantially the whole length of the base plate."

A. Yes, sir.

X-Q. 1195. You remember that statement?

A. Yes, sir.

X-Q. 1196. That is correct?

A. That is correct.

(Mr. Church: Are you going to offer that in evidence?)

(Mr. Stackpole: After I have identified his signature.)

(Mr. Church: Are you going to let me see it, whether you offer it in evidence or not?)

(Mr. Stackpole: No.)

(Mr. Church: I think I have a right to see the whole affidavit.)

(Mr. Stackpole: When we offer it in evidence, the Judge will accept it or rule it out.)

X-Q. 1197. (By Mr. Stackpole.) How many affidavits, prepared by Mr. Howe, do you recall seeing and reading?

(Mr. Church: You mean his own affidavits?)

(Mr. Stackpole: No, those prepared by Mr. Howe.)

A. The only definite impression I have is three, I believe, one of Mr. Brown, one by E. C. Lipps, and mine.

X-Q. 1198. I show you what purports to be an affidavit by you with the caption "In the United States District Court, District of Massachusetts. Thomson Electric Welding Company et al. vs. Barney & Berry, Incorporated. In Equity On Harmatta Patent No. 1,046,066." And at the end of the affidavit appears the name of Fred P. McBerty. Do you recognize your signature?

A. Yes, I would acknowledge that signature.

X-Q. 1199. Is this the affidavit that you gave to Mr. Howe at the time of his visit to you in 1913?

(Mr. Church: Let him read it.)

(Mr. Stackpole: Certainly; I want him to identify it thoroughly (handing to the witness; the witness spends 15 minutes on examining the affidavit).)

(The Witness: Your Honor, may I see that exhibit?)

(The Court: This one?)

(The Witness: Yes, your Honor.)

(The Court: Any objection to his seeing this?)

(Mr. Stackpole: No, I have no objection to his seeing any exhibit in the case.)

(Question read.)

A. Yes, sir, I would say that was an affidavit given to Mr. Howe at that time.

X-Q. 1200. And sworn to by you before C. E. Stephens, notary public in and for Trumbull County, at Warren, Ohio, with the seal attached as appears on the affidavit?

A. Yes, sir.

(Mr. Stackpole: As part of the cross-examination, of this witness, we offer this affidavit in evidence as Plaintiff's Exhibit No. 28.)

X-Q. 1201. What exhibits are attached to this affidavit? Will you give a list of them? Take the affidavit and give a list of the exhibits.

A. Yes, I will give them. "K" is the discharge of F. P. McBerty from the United States Revenue Cutter Service. You don't care about the date, do you?

X-Q. 1202. No.

A. And what is apparently the original sketch from which the welding machine was built in 1901. That is marked Exhibit M. Another is a statement of the affairs of the Peerless Electric Company of July 31st, 1903. I do not see any identification mark there. Here is a bill of L. E. Skinner to Mr. McBerty, December 19, 1902. Here is a short piece of fan center or spider with a piece of material attached, approximately of the same grade of material as used in the fan blades. Also, a complete fan blade attached to a piece of spider with three spot welds. Also, a pencil sketch of the electric welding machine, marked Exhibit R. A second pencil sketch of the electric welding machine marked Exhibit S. Another, a book marked Exhibit L, which is the record book of the transformer iron tests. Also cost covering house built by F. P. McBerty.

X-Q. 1203. These exhibits appear to you to be authentic?

A. Yes, they do.

(Mr. Stackpole: I would very much like to have the Clerk mark that, before it gets away. Mark as filed, because I would like to have that exhibit kept in the custody of the Court. It is an important exhibit. I will ask one or two questions and then I will be through with this witness.)

X-Q. 1204. Referring now to the 1901 catalog of the Warren Electric & Specialty Company, were all the fan blades secured to the spiders by rivets in the cases of the fans shown in this catalog as A-5, A-6, E-2, E-3 and G-1?

A. A-5 and A-6, that is all the A type of fans, and all the E type of fans were riveted invariably, and the cut illustrates G-1 as having been riveted also.

X-Q. 1205. And each blade is secured to each spider arm with two, or in some cases, three rivets?

A. It would be so, yes, sir. It does not always show in the figure, depending upon the way the light strikes the fan blade. The light might so strike it as to cause a reflection, which would prevent its being seen.

(Mr. Stackpole: That is all the cross-examination.)

(McBerty's testimony continued, page 399.)

(Mr. Church: May I put another witness on directly after recess?)

(The Court: Certainly. I will endorse the order on that affidavit, if you want, or whatever you want.)

(Mr. Stackpole: I don't care for that. All I want is a general order that covers all the exhibits. All I want is that they may not be lost or in any way modified.)

(The Court: I will put it in charge of the marshal.)

(Mr. Stackpole: Oh, we have absolute confidence in Mr. Church. Exhibits do sometimes disappear in a most remarkable way.)

JASPER W. POWERS.

JASPER W. POWERS, after being duly sworn on behalf of the defendant, testified as follows:

Direct examination by Mr. PATTISON:

Question 1. Mr. Powers, state your full name, please.

Answer. Jasper William Powers.

Q. 2. Where do you live?

A. 526 North Third Street, Barberton, Ohio.

Q. 3. What is your present occupation?

A. I am in charge of a machine shop at the Babcock & Wilcox Company, charge of tools and production at Barberton, Ohio.

Q. 4. Are you acquainted with Mr. Fred P. McBerty?

A. I am.

X-Q. 5. About how long have you known him?

A. Since the early part of 1898.

X-Q. 6. Where did you meet him?

A. At the works of the Warren Electric & Specialty Company at Warren.

Q. 7. What were your duties there?

A. I was engaged as a machinist and toolmaker.

Q. 8. How long did you occupy that position?

A. With the Warren Electric & Specialty Company, until some time during 1902, when it was taken over by the Peerless Electric Company. I was with the Peerless then in the same capacity until May of 1903.

Q. 9. While you were working at the Warren Electric & Specialty Company, did you see an electric welding machine there?

A. I did.

Q. 10. Do you know who designed or got up that machine?

A. The first knowledge I had of it, or of a machine of that kind, was suggested to me by Mr. McBerty.

Q. 11. How did he happen to suggest it to you?

A. As one of the tools, he wanted to build to perform certain operations on products that we were building.

(The Court: Were you his superior officer?)

A. I was not. I was directly under Mr. McBerty.

Q. 12. (By Mr. Pattison.) What do you know about this electric welding machine, the construction of it?

A. I had all to do with the building of it, and I know that primarily the machine was built as what he called a butt welder for welding ends of guard rings that we intended to use, or were going to use on a cheaper fan that we intended building.

Q. 13. When, if you know, was this cheaper fan developed?

A. I would say—we must have done it, or we must have been doing some work on it the latter part of 1900, although, as I recollect, there was no great amount of work being done on the fan itself until 1901; that is, the manufacturing months, the early months of 1901.

Q. 14. What was the difference between this cheaper fan and the fan that had been previously made by the company?

A. All parts of this fan were made of iron where we could use it, in place of brass, as on the fan we had built the two or three seasons previous.

Q. 15. What parts of this cheaper fan were made of iron?

A. The guards and blades, the hub, I don't recall anything else.

Q. 16. Did you do any welding on this machine?

A. I did.

Q. 17. Would you recognize that machine, do you think, if it were shown to you?

A. I would.

Q. 18. Will you please examine this machine over here and point out to the court the parts that you worked on? This is marked in this case for identification "Exhibit B, McBerty Machine."

A. The angle piece which makes up the base of the machine I made. I installed a piece of fibre insulation the full length of the machine, which is different than the one now in place. I made the levers, or similar levers, to what is now on the machine. I made at that time ridges and sliding blocks or similar blocks; and also machined up the castings, the terminals on the end of the cables, as I recall. It is many years since I have seen it. I recall similar castings to that.

Q. 19. What material did you make the sliding blocks of that machine?

A. We had to use such material as we could find around the shop for all the tools we made. I recall there was one pair of blocks made out of forged round copper bars.

Q. 20. To what shape did you forge that?

A. It was flattened down to a rectangular shape.

Q. 21. Did you do any welding at all on this machine?

A. I did.

Q. 22. About when did you first do any welding on it?

A. I can not give you the exact month, but I can fix the date very clearly for or about the spring of 1901.

Q. 23. Was this machine completed by you in 1901?

A. It was completed, yes, sir.

Q. 24. Have you any means by which you fix the date of the completion of this machine?

A. I have.

Q. 25. Please state.

A. My brother was with the Buffalo Exposition in 1901, and was doing magic work. We knew he was using at that time a set of rings that were welded together by a blacksmith to answer the purpose for his little act. As soon as we got the welding on this machine, I made him up a set of rings complete, filing them up, and had them nickel-plated, and sent them to him, and he used them at the Pan-American Exposition that summer.

Q. 26. What summer was that?

A. That was 1901.

Q. 27. Do you remember any incident during your brother's show that would bring back the welding to you?

A. Yes, sir. The fellows like to do all the talking they can while they are working, and I remember him saying, "Gentlemen, you will closely observe these rings are not made in a blacksmith shop; these are electric welded."

Q. 28. So you remember it on that account?

A. Yes, sir.

Q. 29. What time of the year was it you first went to the Exposition at Buffalo?

A. I didn't go to Buffalo before July.

Q. 30. How long before you went to Buffalo was it that you had completed this machine for Mr. McBerty?

A. As I remember, I sent him those rings in April or May. In April, I would say, and we had the machine in operation on the production before that time.

Q. 31. What kind of work in the production was this machine doing before that time?

A. The welding of the guard rings.

Q. 32. Do you know whether there was any other kind of welding done on that machine?

A. There was.

Q. 33. What kind was it?

A. What was then termed as spot welding.

Q. 34. Did you see any spot welding?

A. I did.

Q. 35. State what, if anything, you saw of the spot welding?

A. All of the spot welding that I can recall was experimental, or development work.

Q. 36. Of what character?

A. As development in trying out the machine on that class of work.

Q. 37. What class of work did you see this spot welding done on?

A. One of our samples, I recall, as having tried to take apart, and that was what we called our transformer iron. Afterwards, there were a number of samples around the shop.

Q. 38. What kind of samples?

A. Such as the fan blade stock that we were using, some with the spider welded to the fan blades.

Q. 39. Did you see any complete fan blades with the spiders?

A. I don't recall having seen any complete.

Q. 40. You said a moment ago you saw this sample tested. How did you see it tested?

A. By trying to separate the two pieces.

Q. 41. What was the result of this effort?

A. I have seen it on a piece of transformer iron. We pulled a piece of the metal out, instead of pulling the weld apart.

Q. 42. Did you examine that fan blade you say you saw spot welded to the spider?

A. Not any more than casually. The whole thing appealed to me; it was new. I don't recall how much examination I gave of those things, but I do know that we were spot welding, and that we did do different operations on there than butt welding.

Q. 43. Did you regard the spot welding as effective?

A. I would.

Q. 44. Did they seem to you to serve the purpose of rivets effectively?

A. They did.

Q. 45. Did you hear of any talk that would indicate the welds were or were not successful?

(Mr. Stackpole: That is objected to as hearsay.)

(The Court: Yes, I will sustain that objection.)

Q. 46. Then, as I understand you, you regarded the spot welds as being effective to serve the purpose of rivets?

A. I did.

Q. 47. In examining that machine, do you regard those parts which you pointed out there as the original parts you made?

A. I could not identify them as the original ones, except the lower members. I know that the insulation between the two is not the same.

Q. 48. You refer to the insulation extending through the space between the base—do you know whether that remained that way all the time?

A. No.

Q. 49. What was done about that?

A. That insulation was taken out and other insulation was put in place.

(The Court: During the time of the experiments?)

A. Along about that time; all I would say in the spring of 1901.

Q. 50. (By Mr. Pattison) Was that insulation as long as the first insulation that was put in there?

A. It was not.

Q. 51. Do you know why that insulation was shortened up?

A. Mr. McBerty had that done, and it wasn't until after that change was made that I knew why it was being done. The machine left my department as soon as it was completed, or as soon as I completed installing it in the fan motor department, as we termed it, which was separate from the machine shop.

Q. 52. Do you know why the spot welding was not adopted as a general manufacturing proposition for this cheap fan?

A. Not entirely, no.

Q. 53. Tell the Court what, if anything, you know about that.

A. Your Honor, I had built up and made a complete line of tools for riveting blades, for riveting spiders, and the men were trained for doing the work in that way; and while I was responsible for the production, for whatever fans we built, that is, the mechanical work on whatever fans were built, I rather argued in favor of continuing the riveting. The season was coming on, as I remember, and we had everything required to continue the manufacture of fans, or proceed with the manufacture of fans, by riveting.

Q. 54. You mean that you argued; with whom did you argue about that?

A. Our manager, Mr. Gillmer, and Mr. McBerty, who, as I remember, rather favored, did favor welding of the iron blades to the spiders.

Q. 55. Then at the time Mr. McBerty spot welded the blades to the spiders, you and Mr. Gillmer and Mr. McBerty discussed its regular manufacture by the company?

A. Yes, sir.

Q. 56. And you objected to it for the reasons you stated?

A. Yes, sir.

Q. 57. And they favored it?

A. Well, Mr. Gillmer did, and we proceeded to make them that way, by riveting.

Q. 58. How were the rivets headed up, at that time, by hand or machine?

A. They were what we call hand riveted.

(Mr. Pattison: That is all.)

Cross-examination by MR. STACKPOLE:

X-Q. 59. During the last three or four years, when was your attention directed again to the work that was done on this machine in 1901?

A. As I remember, it came up about—some time during 1913.

X-Q. 60. 1913?

A. Yes, sir.

X-Q. 61. Did you talk with Mr. McBerty about it in 1913?

A. Yes, sir.

X-Q. 62. Did you talk with him more recently about it than that?

A. Yes, sir.

X-Q. 63. In 1917?

A. Yes, sir.

X-Q. 64. And Mr. McBerty showed you photographs of that machine then?

A. No.

X-Q. 65. Showed you any samples then of spot welding?

A. Not that I recall.

X-Q. 66. Do you recall any samples of spot welding shown you in the year 1913?

A. Yes, sir.

X-Q. 67. By whom?

A. By Mr. McBerty.

X-Q. 68. You remember of seeing Mr. Howe in 1913?

A. I don't recall Mr. Howe.

X-Q. 69. That is all.

Redirect Examination by MR. PATTISON:

Re-D. Q. 70. Mr. Powers, have you ever seen any spot welding, or have you seen any spot welding machine except this?

A. That is the only spot welding machine I have ever seen.

Re-D. Q. 71. From 1901 up to the present time?

A. At any time.

Re-D. Q. 72. And I suppose that was why it was impressed upon your mind?

A. That is the only thing I would have to recall it to my mind.

(Mr. Pattison: That is all.)

JOHN A. McDONALD, after being duly sworn on behalf of the defendant, testified as follows:

Direct Examination by MR. PATTISON:

Question 1. Please state your full name.

Answer. John A. McDonald.

Q. 2. Where are you now living?

A. Warren, Ohio.

Q. 3. What is your present occupation?

A. I am employed with the Trumbull Public Service Company.

Q. 4. State briefly what your duties with that company are.

A. Well, sir, they are mostly electrical construction work.

Q. 5. Were you at any time employed with the Warren Electric & Specialty Company at Warren, Ohio?

A. I was.

Q. 6. What period of time did your employment cover with that company?

A. From 1898 to 1911.

Q. 7. Did you accept work for the Peerless Electric Company?

A. I did, yes, sir.

Q. 8. You mean you continued your service from the Warren Company to the Peerless Electric Company, down to 1911?

A. Yes, sir.

Q. 9. What material were the fan blades and spiders made of in the year 1898 when you went there?

A. Made of brass.

Q. 10. Did they make any change in that respect while you were with them in the manufacture of their fans, or any additions?

A. Yes, sir.

Q. 11. What was that change?

A. Well, they changed the center, in the first place. When I first went there, the center had three rivets in, then they made the center with two rivets in.

Q. 12. Was any change in the material made?

A. Yes, sir, they changed from brass to steel.

Q. 13. In connection with what fan was that change from brass to steel made.

A. It was in connection with a cheap fan they were going to put out, and I think, well, I am sure, they called it G-2 fan; G-2 and G-1.

Q. 14. What were your duties at the Warren Electric & Specialty Company?

A. Testing fans and fan motors.

Q. 15. Please explain to the Court just what you did there so that he can understand.

A. The fans were put in trays, and they went to what they call assemblers, who assembled or put them together. After they put them together, they came to me and I tested them for current, short circuit, speed, appearance, anything I could find wrong with them.

Q. 16. Of what material were the fan guards of these cheaper fans made?

A. Made of iron.

Q. 17. Did the fan guards have rings in them?

A. Yes, sir.

Q. 18. How were the ends of these rings connected in this cheap fan, as you remember?

A. Welded.

Q. 19. With what were they welded?

A. With the welding machine.

Q. 20. What caused that welding in that machine?

A. The current.

Q. 21. The electric current?

A. Yes, sir.

Q. 22. Did you see any of that welding done?

A. Yes, sir.

Q. 23. Did you do any of it yourself?

A. I did, but later on.

Q. 24. When was it you first saw this welding machine at the Warren Electric & Specialty Company's plant?

A. I would say it was in the early spring of 1901. Now, that may have been February or March.

Q. 25. Do you remember of seeing any catalogs of the Warren Electric & Specialty Company while you were there?

A. I have seen the catalogs, but I could not say now which ones they were.

Q. 26. I hand you a catalog and ask you if you know what it is? See if you recognize it?

A. (Examining catalog) This must be the 1901 catalog, although I do not see any date on it.

Q. 27. I think you will find the date on the front page.

A. Yes, sir, this is the season of 1901.

(Mr. Church: Just enter that the catalog referred to by the witness is the Warren Electric & Specialty Company's catalog for the season of 1901, and is Defendant's Exhibit No. 2.)

Q. 28. You say you saw and did butt welding on this machine?

A. Yes, sir.

Q. 29. How long after that machine was made, before you saw the butt welding?

A. Well, I would not say: it wasn't long.

Q. 30. Was that the first electric welding machine you had ever seen?

A. Yes, sir.

Q. 31. Were you interested in it?

A. Why, I had understood they were going to put out this cheap fan and they were going to weld the rings.

Q. 32. Were you interested in that machine?

A. No.

Q. 33. You examined it, I suppose?

A. I didn't examine the machine to any extent.

Q. 34. Was there any other kind of welding done on that machine that you know of?

A. Yes, sir.

Q. 35. What kind of welding?

A. Well, I would call it spot welding.

Q. 36. Did you see anything spot welded?

A. Yes, sir.

Q. 37. What did you see spot welded?

A. I saw Mr. McBerty spot weld one blade, not one blade, I mean by that one set of blades, the thing complete.

Q. 38. The four parts?

A. Yes, sir.

(Mr. Fish: That is not what he said; he said one set of blades.)

Q. 39. (By Mr. Church) Please explain what you mean by a set of blades?

A. One fan complete, four blades welded on one spider.

Q. 40. Did you see while you were there only this one complete set of blades spot welded?

A. No, sir, I saw more than that.

Q. 41. How did you happen to see it?

A. I saw them—well, I saw them when I used them, in fact. That is about the only time I saw them.

Q. 42. In what way did you use them?

A. I tested them on the fans, put them on the fans, and sent them through the factory.

Q. 43. You mean they reached you, and they passed through the factory, and you tested them? Is that what you mean?

A. I would not say they reached me when they went through the factory; they came to me from the stock room.

Q. 44. What was done with them after they came to you from the stock room?

A. I put them on the fans and sent them on through the factory.

Q. 45. How many do you think you put on fans—you mean on the motors?

A. Yes, sir.

Q. 46. How many did you put on motors and send to the stock room?

A. I would not say.

Q. 47. What would be your best recollection about that?

A. I would say a dozen or 12.

Q. 48. When these motors came to you, you say you put the spot welded blades on them?

A. Yes, sir.

Q. 49. Explain to the Court just exactly what you did do in that connection.

A. Well, sir, when I tested them, I always used the test blades that I knew were perfectly balanced and true and ran every fan with that one blade. The motor was all right; I took another finished blade and put it on the fan and ran it to see that it was all right. If it ran smooth, and all right, I passed them over to another bench where the guards were put on by another helper as they call them, and he puts the guards on and sends them back to me again. So, after I had tested half a dozen, and they ran all right, then they went to the packer.

Q. 50. You said you used a blade as a test blade. What kind of a blade was that that you used as a test blade?

A. I used one of these spot welded blades as a test blade for some time.

Q. 51. You remember that?

A. Yes, sir.

Q. 52. Am I correct in understanding that you put spot welded blades on fans and sent through to the stock room?

A. The fan blade I used then, the spot welded fan I used was not finished; that is, it was not japanned.

Q. 53. Did you put any japanned blades on the spiders?

A. Yes, sir. I put them on the finished fans; I got them from the stock room.

A. Yes, sir.

Q. 54. Spot welded?

A. Yes, sir.

Q. 55. How did these fans come to you; in what way were they brought to you?

A. Well, they went through the factory in trays; they came from the finishing department, the lacquering department, and they went then to the stock room, in trays, and when I got them, I got a whole tray at a time.

Q. 56. Did you or not regard the spot welds as serving the purpose of rivets?

A. I did.

Q. 57. On all these fans that you tested, that were spot welded?

A. Yes, sir.

Q. 58. Did any of those blades come loose while you were testing them?

A. No, sir, not to my knowledge.

Q. 59. Was your inspection the final inspection of the factory?

A. It was, yes, sir.

Q. 60. You were held responsible then for the goods going out in proper shape?

A. Yes, sir.

Q. 61. Did any bad work ever come back to you because not properly inspected?

A. Yes, sir.

Q. 62. Did any of these spot welded blades come back to you as not properly inspected?

A. Not to my knowledge.

Q. 63. Did any come back to you while you were with the Warren Electric & Specialty Company?

A. Not to my knowledge.

Q. 64. Or while you were with the Peerless Electric Company?

A. No, sir.

Q. 65. Were there other kinds of blades and fans that came back to you?

A. Yes, sir.

Q. 66. Have you a sufficient recollection of that welding machine to recognize any part of it?

A. I think I could recognize the machine.

Q. 67. I will ask you to examine this machine over here, and see what it is.

A. (Examining machine) I would say this is practically the same machine. (The witness refers to Exhibit B, McBerty Machine.)

Q. 68. What is there about that machine that enables you to recognize it?

A. Well, these handles, although two of them had wooden handles on, when I used it, and these jaws were apparently the same, only in the other jaws I used grooves.

Q. 69. You mean the jaws you used for the butt welding?

A. Yes, sir.

Q. 70. Did you ever do any spot welding upon that machine?

A. I did not.

(Mr. Church: That is all.

Cross-examination by Mr. STACKPOLE:

X-Q. 71. Do you recall a visit to you in 1913 by Mr. McBerty and Mr. Howe?

A. Yes, sir.

X-Q. 72. Do you remember Mr. Howe?

A. I remember of him.

X-Q. 73. Did you tell him at that visit of this welding machine?

A. I did.

X-Q. 74. Did you tell him you had seen McBerty do spot welding on it?

A. I don't remember.

X-Q. 75. Did you tell Mr. Howe and Mr. McBerty then that you had used these spot welded blades and spiders in fans?

A. I would not say.

X-Q. 76. Did you tell him that you had used that spot welded blade and spider as a test?

A. I would not say, for Mr. Howe and Mr. McBerty came to me just on the spur of the moment, and it had been some time since I had thought about spot welding.

X-Q. 77. That was in 1913?

A. Yes, sir.

X-Q. 78. At that time you did recall these things?

A. I didn't recall them distinctly at that time. They took me by surprise by coming up to where I was. I was living in the country at that time and hadn't any chance to think about it.

X-Q. 79. And you did not give Mr. Howe an affidavit?

A. I think Mr. Howe wrote out an affidavit and I signed it.

X-Q. 80. You think he did?

A. Well, I know he did.

X-Q. 81. You know he did?

A. Yes, sir.

X-Q. 82. You have a distinct recollection of that?

A. Yes, sir.

X-Q. 83. Did you make oath to that affidavit before a notary?

A. I did not.

X-Q. 84. It was simply a statement then, and not an affidavit?

A. Yes, sir.

X-Q. 85. Did Mr. Howe take it away with him, or did you send it to him?

A. Mr. Howe took it with him.

X-Q. 86. After that, did you talk to Mr. McBerty to refresh your recollection as to these welding matters of 1901?

A. I did not.

X-Q. 87. When did you see Mr. McBerty last?

A. Last?

X-Q. 88. Yes.

A. This morning.

X-Q. 89. Did you talk with him at all about this matter in the last year or so?

A. Not to Mr. McBerty.

X-Q. 90. With whom did you talk?

A. Mr. Pattison.

X-Q. 91. Any one else?

A. One evening I talked to Mr. Church.

X-Q. 92. Did Mr. Pattison show you this 1901 catalog?

A. Not to my knowledge.

X-Q. 93. Did Mr. Church?

A. No, sir.

X-Q. 94. Is this the first time you have seen this catalog—to-day?

A. I think it is. I may possibly have seen it at the factory; I won't say.

X-Q. 95. That statement you gave to Mr. Howe, did you sign that at your place in the country?

A. I did.

X-Q. 96. But you didn't swear to it?

A. I know I didn't swear to it, for Mr. McBerty asked me to come to Warren and go and have it sworn to, and I told him I would the first time I was down to Warren. I didn't go to Warren for some time, and Mr. McBerty wrote to me. I remember of receiving a letter asking me if I would not come down to Warren and sign that or have it sworn to. The first time I went to Warren I went over to McBerty's office and Mr. McBerty was not there. He was out somewhere, I would not say now where.

X-Q. 97. You had the statement with you at that time?

A. I didn't, no, sir.

Q. 98. You expected to get it at Mr. McBerty's office?

A. Yes, sir, and I had to go back home again and I know it was dropped right there.

(The Court then took the noon recess.)

AFTERNOON SESSION.

The Court convened pursuant to the noon recess, at 1:30 P. M.; same parties present as before.

(The Court: Will the 31st day of July be a convenient date for counsel to argue this case?)

(Mr. Church: That will be very satisfactory to me. That is the time I shall go on my vacation.)

(Mr. Fish: Will your Honor allow two days if necessary?)

(The Court: If necessary. I am not encouraging two days.)

(Mr. Fish: I understand that. Neither are we, at least, I am not, but sometimes it takes longer than expected.)

(The Court: That is true. I will be here the evening before, so that we can have the full day without any restrictions of any kind.)

(Mr. Fish: By that time I think we will know how much time we ought to take. We can divide the time or not.)

(The Court: You can say a good deal in an eight-hour day—of course, if we have that length of day.)

(Mr. Fish: An eight-hour day is a killing proposition. The last two hours in this kind of work is generally wasted.)

(The Court: So long as you do not produce the same effect on me that another argument did a few weeks ago here. I had something very akin to dementia a few weeks ago.)

(Mr. Fish: I am satisfied an argument of too many hours is unfortunate both to Court and counsel.)

(The Court: Yes.)

F. P. McBERTY, recalled for further redirect examination, testified as follows:

Examined by MR. CHURCH:

Re-D. Q. 1206. Mr. McBerty, will you please examine the sample, Exhibit O, attached to your affidavit dated October 9, 1913, produced during your cross-examination today, and compare it with the sample, Defendant's Exhibit M, and state the result of

that comparison, and what, if any, relation one sample bears to the other?

A. The sample O indicates that it was cut off from the end of this sample M, as far as the thin section is concerned, the sheet section, and the heavy section or piece spot welded to the back of the thin section has the appearance of having been cut off from the spider arm of M. The parts match—

(The Court: One of the spider arms?)

(The Witness: One of the spider arms, yes, your Honor.)

Re-D. Q. 1207. (By Mr. Church.) How do you account for the discoloration, or difference in surface appearance of those several samples?

A. The discoloration would be due to the heat induced by the spot welding. You raise a piece of metal to a certain temperature, and it turns blue.

Re-D. Q. 1208. Why do you say that the sample of the fragment of spider arm shown on this sample Exhibit O was at one time attached to the spider of Exhibit M; what indication is there?

A. The spider arms shows a cut as though the piece in question had been partly severed with a pair of shears or a tinner's tool, and the balance broken off and both sections show practically the same mark or indication, and there is a hole through the center of the spider arm attached to Exhibit M, which is cut partly through, and the balance of the grooved recess is on the small piece attached to Sample O which would indicate very clearly they were the same piece originally.

Re-D. Q. 1209. Is either of the samples that have been produced by the plaintiff in connection with your affidavit the sample that was sent by you to Mr. McGill, as testified by you yesterday?

A. Neither. Neither of the samples fits the center section, and the sample Mr. McGill had would fit this in the condition it was when I sent it to him.

Re-D. Q. 1210. Your affidavit of October 9, 1913, and the sample exhibits annexed thereto were produced during your cross-examination by counsel for plaintiff after you had produced your sample "Defendant's Exhibit M" on your direct examination, were they not?

A. They were.

Re-D. Q. 1211. Will you please explain to the Court fully why you did not give to nor show to Mr. Howe the sample, Defendant's Exhibit M?

A. When we first went into the welding business, the National Electric Welder Company engaged in the manufacture of spot welding machines at Warren, Ohio, they knew nothing about the patent business; very shortly after that, information came to us

of the litigation in the spot welding field, and gave us the impression we might eventually be involved in something of the kind ourselves. I will refer to this electric welding machine at the same time. As soon as this information came to us, I thought it policy to round up everything in the shape of information that I could possibly secure, regarding my early use of this spot welding work, and I purchased the spot welding machine or the electric welding machine that is shown here as exhibit—whatever the number of the exhibit is—as my first experience along that line. Later on, suit was entered against the Toledo Company under the Har-matta patent, or rather, suit was begun against Barney & Berry Company and the Toledo Company, and defended by the Toledo Company, suit being brought by the Thomson Electric Welding Company, and this, of course, interested us directly, for the simple reason if this suit was sustained, we would be in trouble, as far as the patent situation was concerned. The General Fireproofing Company of Youngstown, Ohio, who have a number of the machines, and who were at that time our best customer, were close by, and were apparently much interested in the patent situation also. I saw Mr. A. C. White, who is a mechanical engineer, and talked this matter over with him about this time, and suggested I see his brother; I don't remember his initials, but I think he is vice-president or president, or was at that time, of the General Fireproofing Company, and his offices were in New York City. Mr. White later on advised me that his brother would be in Youngstown, and asked me to come down and see him, which I did, and we talked over this patent situation, and I advised him at that time regarding my former use of spot welding and told him I had the machine, had the samples, and what we had done in the way of spot welding the blades; that is, gave him an idea that the work was not new or novel and could be carried on to advantage. Mr. White looked over the sample and he also looked over the affidavits that I personally had taken from Mr. Brown and Mr. Lipps, regarding the prior use, and suggested that for their own protection they would like to have those samples and affidavits left in their possession. I consulted with our Mr. J. Nota McGill, regarding this, and he was not favorable to the idea of letting those samples at that time go out of my hands. When this suit had been entered against Barney & Berry Company, the General Fireproofing Company sent a couple of representatives to Cincinnati, apparently to purchase some welding machines, but in reality, to talk over with them the patent situation with a view of finding out what effort was going to be made to protect the users of spot welding machines. They talked to Mr. Warren, I think, at least to the man in authority down there, along these lines, and finally suggested the fireproofing company would be glad to contribute towards a fund to be used as a defense fund in this suit, and the only stipulation they made was they be permitted to participate in the defense. This the Toledo Company refused to do. In fact, Mr. White tells me they absolutely refused to consider the proposition at all.

(Objected to.)

Re-D. Q. 1212. Just confine yourself to what you know, not what somebody told you.

A. Anyhow, the representatives returned and reported there was no deal on, and Mr. White very shortly after that suggested that he would again be much interested in having that sample in his own hands with that information. We referred the matter to Mr. McGill, and Mr. McGill did not consider it a reasonable proposition. Later on, the matter of looking out for our own defense was brought up, the suggestion was made we send to Mr. McGill the samples and the information we had at hand, with a view of having him approach the attorneys of the Thomson Electric Company, and also the attorneys of the Toledo Company, with a view of either getting protection or immunity from litigation in some way, and relieving ourselves of the situation that was liable to cause us trouble. When the matter was brought up, we sent the sample to Mr. McGill and mentioned it to Mr. White, and he absolutely refused to consider that as being a practical solution. He said, "Do not send them." He said, "If you ever get them in the hands of the Toledo people, they are crooks, you will never get them back." Those are the words, as near as I can repeat them, of Mr. White. Mr. McGill suggested in place of giving up the complete sample we cut the sample in two, he retaining a portion of the sample, and we the other, and this was done. We retained that in our possession, that is, the National Company retained it in its possession, this sample known as Exhibit M, and it was in our possession until it was turned over finally to the attorneys in the suit in question. I might mention if that sample had been turned over, it would have been very hard to find it at the present time.

Re-D. Q. 1213. When you were making your test on this machine at the Ford plant yesterday, something was said about the heating of the machine. Tell the Court what provision is made in modern spot welding machines for preventing over-heating, due to frequent use?

A. The transformers of course are built with much greater capacity than this machine has, and the welding points, the electrodes, are so arranged that a stream of cold water passes through them or near to the point of radiation.

Re-D. Q. 1214. So, there being no cooling means on this old machine, it could not be operated so fast without over-heating as modern machines, is that true?

A. No, that machine would not operate successfully as a spot welder, pulling the quantity of current such as I made yesterday, for any length of time without excessive heating.

Re-D. Q. 1215. In your affidavit of October 9th, 1913, there is a statement on page 5 to this effect, relating to the obtaining of the welding machine from the Peerless Company:

"A few years ago I am informed it was taken down because the Peerless Company decided to buy their guards instead of making them, and the welding machine was placed in the stock room. It was there when I bought it in 1911 and has been in my possession at the works of the National Electric Welder Co. ever since."

What did you mean by that expression "stock room"?

A. They have a third floor in the building where the fan motor department was located, and this third floor is used for the storing of fans, out-of-date fans that are returned as defective, and such obsolete machines as they do not use in the present methods of construction.

Re-D. Q. 1216. The wording of that affidavit is not yours?

A. I mentioned the fact the machine had been scrapped; it wasn't in use, and they anticipated disposing of it as scrap later on.

Re-D. Q. 1217. I mean to say the actual language used in this affidavit is not yours, is it?

A. Oh, no.

Re-D. Q. 1218. Who drew the affidavit?

A. That affidavit there was drawn by Mr. Howe.

Re-D. Q. 1219. That is in his language?

A. Yes, sir.

Re-D. Q. 1220. Expressing the ideas you communicated to him?

A. Yes, sir.

Re-D. Q. 1221. In the course of your cross-examination reference was made to a Mr. Smith at one time; some of us did not know what Mr. Smith was referred to. Do you recall what Mr. Smith was in your mind when you were speaking?

A. I was referring to a man named Newton A. Smith.

Re-D. Q. 1222. Who was he?

A. He was a man employed by the Thomson Spot Welder Company, apparently a Secret Service man, or spy, who entered the employ of the National Company to secure such information as was available in searching through our files and records.

(Mr. Fish: You say Mr. Smith was referred to in cross-examination?)

(Mr. Church: I think so.)

(Mr. Fish: No, no, not by me, no reference was made to him.)

A. I referred to Mr. Smith, Newton A. Smith.

(The Court: He spoke of a Mr. Smith. Go on with your story.)

Re-D. Q. 1223. How long was Mr. Smith with you?

A. (Referring to a telegram.) N. A. Smith was in our employ from March 9th to June 13th, 1917, as per his affidavit. I am referring to a telegram I received from the home office.

Re-D. Q. 1224. What affidavit is that referring to?

A. Mr. Smith made an affidavit for the benefit of the Thomson Company in a suit brought against the National Electric Welder Company in Cleveland.

Re-D. Q. 1225. And he in that affidavit referred to the fact he had been in the employ of the National Electric Welder Company in Cleveland?

A. He did.

Re-D. Q. 1226. And he gave in great detail the spyings and doings, did he not, on that company?

A. He did.

Re-D. Q. 1227. State in a general way what he did while he was there, of which you have knowledge?

A. He was employed there as a mechanic or foreman of the plant, and when he first came there I asked him if he had any connection with the Thomson Electric Welding Company or the Spot Welder Company, the General Electric Company or the Westinghouse Company, and his reply was he had absolutely no connection with them and knew nothing about the companies in question.

Re-D. Q. 1228. Did he seem to be a competent person?

A. He seemed to be a reasonably good mechanic.

Re-D. Q. 1229. Upon those representations, you employed him?

A. Upon those representations, I employed him; he worked with us for some months, and we found at one time Mrs. McBerty, who had charge of the office there, came back unexpectedly in the evening, just after quitting it, and found Mr. Smith with the safe open. He was much embarrassed and suggested she forgot to lock the safe. She did happen to know she had forgotten to lock the safe, but she knew she had not left it standing open, although it was standing open when Mr. Smith was there. She also found Mr. Smith looking through the papers and correspondence on my desk.

(Mr. Stackpole: This is objected to as not within the knowledge of the witness.)

(The Court: It is all secondary. If you object to it, I will sustain it.)

(Mr. Stackpole: We object to it.)

(The Court: It may go out.)

Re-D. Q. 1230. Has that Mr. Newton A. Smith been in attendance on this trial?

A. He has.

Re-D. Q. 1231. Will you please point him out?

A. Mr. Smith is the man standing up here.

Recross examination by MR. STACKPOLE:

Re-X. Q. 1232. You have referred to the affidavits of Messrs. Brown and Lipps, taken by you.

A. Yes, sir.

Re-X. Q. 1233. Were those the same affidavits that were taken by Mr. Howe, of Messrs. Brown and Lipps?

A. No, I took some affidavits myself, early, that is, in 1912, I think, with reference to the prior use of the welding machine.

Re-X. Q. 1234. Have you copies of those affidavits?

A. I have not with me.

Re-X. Q. 1235. Will you get them and send them to the clerk?

A. I will be glad to.

Re-X. Q. 1236. The originals. What we want are the originals.

(The Court: Yes, the originals.)

(The Witness: I think the originals were turned over to these people.)

(Mr. Fish: Oh, no.)

(The Court: Mr. McBerty says that is not the affidavit turned over to these people.)

(Mr. Fish: These were taken in 1912 by Mr. McBerty himself.)

(The Court: Let us find out what he did with those. Ask him the question.)

Re-X. Q. 1237. What became of the affidavits that you say were taken by you yourself?

A. The originals were turned over to Mr. J. Nota McGill.

Re-X. Q. 1238. For what purpose?

A. To enable him to get in touch with the Thomson representative and Toledo people.

Re-X. Q. 1239. Have you ever seen them since?

A. Not to my knowledge.

Re-X. Q. 1240. You have not got them in your possession now, the originals?

A. No, I have not the originals.

(Mr. Fish: You have copies?)

A. Yes, I am quite positive.

Re-X. Q. 1241. That you know are copies?

A. Yes, sir.

Re-X. Q. 1242. I would like to have you send them to the clerk, if you know they are copies.

A. Yes, sir. How will they be addressed?

(The Court: Send them to the clerk with the title on the outside of the envelope, made by you.)

(Any further cross-examination?)

(Mr. Stackpole: I think not, your Honor.)

ALBERTAS C. TAYLOR.

ALBERTAS C. TAYLOR, after being duly sworn on behalf of the defendant, testified as follows:

Direct examination by MR. PATTISON:

Question 1. State your name, please.

Answer. Albertas C. Taylor.

Q. 2. Where do you live?

A. Warren, Ohio.

Q. 3. What is your present business?

A. Vice-president and general manager of the Taylor Welder Company.

Q. 4. Have you anything to do with electrical welders?

A. Yes, sir.

Q. 5. When did you first see an electric welder?

A. In 1903.

Q. 6. Where did you see that?

A. At the Peerless Electric Company at Warren, Ohio.

Q. 7. When did you go to work for the Warren Electric Company?

A. I am not sure whether it was the Warren Electric Company or the Peerless Electric Company; I believe it was the Peerless.

Q. 8. When did you go to work for the Peerless Electric Company?

A. In May, 1903.

Q. 9. How long did you remain with the company?

A. Until the fall of that same year, or about six months.

Q. 10. Where did you then go?

A. I went then to what was known as the Barr Judd Co. They were just entering in the manufacture of conductor pipes and elbows.

Q. 11. Were you later connected with the Winfield Electric Welder Company?

A. Yes, sir.

Q. 12. Who designed the welders for the Winfield Company?

A. I did.

Q. 13. And where did you first learn about the construction of electric welders?

A. At the Peerless Electric Company.

Q. 14. In 1903?

A. Yes, sir.

Q. 15. Did you do any work on this welder?

A. Yes, sir, I operated on several occasions.

Q. 16. What kind of welds did you make on it?

A. I made what is known as the regular butt weld, the same as they used in the manufacture of the rings for fan guards. Also made welds like crossing wires in between the two electrodes, and also on flat sheets by laying them face to face and placing them between the two jaws of the clamp and dies.

Q. 17. Can you produce samples of the work that you did in 1903 on this machine?

A. No, I can not.

Q. 18. I do not mean original samples.

A. No.

Q. 19. And have you any samples with you?

A. I have made samples that were very similar, as near as I can remember, to what I produced at that time.

Q. 20. Will you produce them?

A. Yes, sir (producing samples referred to).

(Mr. Stackpole: We do not think these are competent, being reproductions.)

(The Court: When do you say you made that?)

A. That was made about ten days ago.

Q. 21. And that is representative of what?

A. Of the work done at the Peerless Electric Company in Warren, Ohio.

Q. 22. On what machine?

A. On what is known as D-6, Winfield Butt Welder.

Q. 23. And this was done on the Winfield Butt Welder?

A. Yes, sir.

Q. 24. What do you want this for? You bring this in here to represent what you once did on this old machine? Is that it?

A. Yes, sir, as nearly as I can remember.

(Mr. Stackpole: I think that is objectionable, your Honor?)

(The Court: Well, I don't know. I think it may stand. Go on.)

Q. 25. (By Mr. Pattison.) Is this a fair representation of the butt welding work that you did at the Peerless?

A. I would say it was.

Q. 26. Will you examine this machine, Defendant's Exhibit B, McBerty Machine, and state whether that is the machine on which

you did work represented by this sample you have just produced?

A. Yes, sir, that is made on practically the same machine.

(Mr. Pattison: I offer this exhibit as Defendant's Exhibit 63, a representation of butt welding done by the witness on the McBerty machine in 1903.)

Q. 27. You also referred to welding cross wires. Can you produce a sample representative of the work you did of that character?

A. Yes, sir; this is a sample and represents welds, as near as I can remember, of the kind made at that time.

Q. 28. On the McBerty?

A. On the McBerty Welder at the Peerless plant.

Q. 29. Is this a fair representation of the work you did at that time, as you remember it, on the McBerty machine?

A. Yes, sir.

(Mr. Pattison: This sample is offered as Defendant's Exhibit 64, as representative of the cross wire welding done by the witness on the McBerty machine.)

Q. 30. You also referred to welding sheets together. Can you produce a sample representative of the work done on that machine?

A. Yes, sir; here is the sample (producing).

Q. 31. On what machine did you do this kind of work?

A. On the same machine, No. D-6, Winfield Electric Welder.

Q. 32. Do I understand you did work of which this is a fair representation, on the McBerty machine in the year 1903?

A. Yes, sir.

Q. 33. At the Peerless factory?

A. Yes, sir.

(Mr. Stackpole: I would like to object to that on the ground of immateriality.)

(Mr. Pattison: It goes as to the weight.)

(Mr. Stackpole: On what issue?)

(Mr. Pattison: On what it would do. I might state primarily the object of putting this witness on is to show that beginning with his knowledge of the McBerty machine, he carried it through.)

(The Court: One period in the history of the machine?)

(Mr. Pattison: One period in the history of the machine, and that he produced, commercially, machines of this type. He went into the Winfield Company and designed machines from the knowledge he got here and put out commercial machines.)

Q. 34. Is this a fair representation of the work which you did on the McBerty machine in 1903 at that factory?

A. Yes, sir, as near as I can remember.

(Mr. Pattison: The sample is offered as Defendant's Exhibit 65, representation of welding plates on the McBerty machine by the witness Taylor in 1903.)

Q. 35. Will you please explain to the Court how you operated this machine to make the weld on this Exhibit 65?

A. I laid the two plates face to face, and placed them down edgewise between the two vertical holding dies, and operated what is known as the opposite levers, to bring pressure upon the plate, and at the same time, passed the current through the dies and through the plates and produced the weld.

Q. 36. What time did you go over to the Winfield Company after you left the Peerless Company?

A. In, I would say, about February of 1904.

Q. 37. What work did you do at the Winfield Company when you went there?

A. I was foreman of the machine shop, also did designing.

Q. 38. What kind of designing?

A. Designed new tools, dies, and so forth.

Q. 39. Did the Winfield Company, after you went there, start in the manufacture of electric welding machines?

A. Yes, sir.

Q. 40. When?

A. About, I would say, three or four months, or possibly six months afterwards.

Q. 41. Who designed these electric welding machines for the Winfield Company?

A. I did.

Q. 42. When did you begin the work of designing these machines for the Winfield Company?

A. In about the month of August.

Q. 43. Of what year?

A. Of 1904.

Q. 44. And when, or for what purpose, were these welding machines first made by you?

A. The purpose we intended to put the machines to was for welding fenders and on a white lead holding case, to make it liquid-tight.

Q. 45. What was the next use of electric welding machines at the Winfield Company's plant?

A. The next use of that same machine was to make spot welds.

Q. 46. On what?

A. On white lead kegs, and on elbows, such use as that, stove-pipe elbows.

Q. 47. Were the Winfield Company manufacturing stove-pipe elbows then?

A. Yes, sir.

Q. 48. Can you produce a sample of the spot welding on the stove-pipe elbows that you did at the Winfield Company?

A. Not that I did at that time, no.

Q. 49. Can you produce stove-pipe elbows representative of that work?

A. Yes, sir.

Q. 50. Please do so. (Witness produces same.)

Q. 51. Will you please point out to the Court where the spot weld is on the sample you have produced?

A. The spot welding is in the throat or narrow portion of this section of an elbow.

Q. 52. At the overlapping seam?

A. Yes, sir.

Q. 53. To what extent was this spot welding used for this elbow work?

A. Why, it was used to a considerable extent on the same type of elbows that had the narrow throat. The reason we used that was in the making of this elbow we locked the parts together by a wheel that traveled around, and heretofore we had riveted these parts together, and the rivet would project, that is, the head of the rivet, and the wheel would strike it and sometimes knock the piece out of the machine, and consequently, spoil the elbow, so we conceived the idea of putting spot welds there, which would do away with the rivets, which would have no projection to interfere with the wheel passing around the elbow.

(Mr. Pattison: The first sample elbow, introduced by the witness, is offered in evidence as Defendant's Exhibit 66, Sample of Spot-welded Elbow.)

Q. 54. Can you show to the Court by sketch what you have just explained of the rivet interfering with the machine for forming this elbow?

A. Yes, sir; I have a copy of tracing or a drawing that I made to illustrate this work.

Q. 55. When was this drawing made?

(Mr. Fish: I understand, may it please your Honor, it is distinctly stated by the defendant this is not set up as an answer to the Harmatta patent. This testimony is not competent, if it is not set up in the Answer.)

(The Court: I understand it is not offered for that purpose at all.)

(Mr. Church: It is to show the development of the art.)

A. That drawing, I would say, was made about a year or a year and a half ago.

Q. 56. I notice on this sheet a representation of some sort of machine. What does that represent?

A. That represents the first welder that we built.

Q. 57. What do the dotted lines show on that sketch?

A. The dotted lines represent wheels or rollers which were used for making the fenders.

Q. 58. What do these projections represent?

A. They represent electrodes that took the place of the wheels or rollers in making the spot welds.

(Mr. Pattison: The drawing referred to by the witness is offered as Defendant's Exhibit 67, Drawing of Stove-Pipe Elbow and also First Welding Machine.)

Q. 59. Have you any parts of the original machine represented by that drawing?

A. I have.

Q. 60. Will you produce it?

A. Yes, sir. (Producing.)

Q. 61. When was this machine made, which you have produced, which you have shown?

A. That machine was produced in 1903, or the early part of 1904.

Q. 62. And was it on this machine that the spot welding of the elbows was made?

A. Yes, sir.

Q. 63. Did any of these elbows go out to the trade?

A. Yes, sir, a great many of them.

Q. 64. After making this machine, what was your next development in electric welding machines?

A. The next machine was a butt welding machine.

(Mr. Pattison: This machine is offered as Defendant's Exhibit 68, Taylor First Welding Machine.)

Q. 65. Can you produce a drawing of this butt welding machine to which you have referred?

A. I have a sketch made of the machine, as near as I can remember, as it was at that time.

Q. 66. When did you make a machine corresponding to that sketch?

A. This machine was made, I would say, in 1904, possibly in the middle of the year or the latter part of it.

Q. 67. Was it used after being made?

A. Yes, sir, it was used for butt welding, what we would call fenders for the bending machine, introducing elbows.

Q. 68. Was it used for any other purpose?

A. It was also used a little later for spot welding.

Q. 69. Spot welding what?

A. Spot welding the seam of these elbows, and what was known as the one-piece elbow.

(Mr. Pattison: This drawing is offered in evidence as Defendant's Exhibit 69, Sketch of Taylor Combined Butt and Spot Welding Machine.)

Q. 70. This machine, as represented by the physical exhibit and the sketch, were they made for the purpose of the manufacturing at the Winfield plant, or for some other purpose?

A. These were made for the Winfield Manufacturing Company for their own use.

Q. 71. What did they manufacture?

A. They manufactured oil cans, lanterns, stove-pipe elbows.

Q. 72. After making the butt welding machine, what, if anything, did you do then in the development of electric machines?

A. We then built or started to place on the market spot welding machines and offered them to the trade.

Q. 73. About when was that?

A. This was in the year, about 1906 or 1907, that we started putting the machines on the market.

Q. 74. Have you any of those machines you made at that time? The original machines?

A. Not as I know of. We haven't. Of course, some of them are in use today.

Q. 75. Were any of these machines made in 1906 sold?

A. Yes, sir, but they were not sold, I don't think in 1906.

Q. 76. Were they offered for sale in 1906?

A. They were offered for sale, as I remember.

Q. 77. Were any of them sold later?

A. Yes, sir.

Q. 78. About when?

A. The year of 1908.

Q. 79. Were any placed in the hands of the public before you actually made sales?

A. Yes, sir. We had considerable trouble in getting customers. The manufacturers were very skeptical of it at first, and they seemed to be all waiting to have some one else try it out first, and would see if their competitor was using it, and they also were afraid the parts would not hold together. They were afraid to put it in their product, afraid it would injure their business.

Q. 80. And because of that, you let them try them out before they were sold?

A. Yes, sir, they were put out on trial, and placed without orders, to let them try them out.

Q. 81. Did any of them buy them after you let them have them for a while?

A. Yes, sir.

Q. 82. Can you produce a sketch of the first machine that was commercially sold by the Winfield Company?

A. I have a drawing or sketch here, as near as I can remember it, of the first machine that we made and sold.

Q. 83. Did you sell a machine constructed like that?

A. Yes, sir.

Q. 84. How many do you suppose you sold in 1908 like that?

A. I would say one or two, not over that, I don't think.

Q. 85. Did the Winfield Company continue in the manufacture and sale or offering for sale of these spot welding machines?

A. Yes, sir, of all kinds.

Q. 86. At the time the Winfield Company placed these machines on the market, was there, to your knowledge, any other spot welding machine on the market?

A. No, sir.

Q. 87. Did you know of any other way of making or welding the plates together at that time?

A. I did not.

(Mr. Pattison: This sketch is offered as Defendant's Exhibit 70, Drawing of First Spot Welding Machine placed on the Market by the Winfield Manufacturing Company.)

Q. 88. Was that the name?

A. I believe it was at that time. I am pretty sure the first machines were put out by the Winfield Manufacturing Company, and later, the Winfield Welding Company was organized.

Q. 89. Is the Winfield Company still a manufacturing and selling spot welders?

A. No, sir, not for spot welding purposes. They do use a spot welder for welding and other work which is not considered spot welding.

Q. 90. That is all.

(The Court: Didn't I see a machine on Monday at the plant where we were with the Winfield plate on it?)

(The Witness: I don't know where it was. We have about 75 of those machines here.)

(The Court: I saw a machine there with the Winfield plate on.)

(Mr. Church: I guess you must have seen that at the Ford plant. It was for the use of the Winfield machine that the Ford Company was sued.)

(The Court: It was on Monday I saw it.)

Q. 91. Were there any Winfield machines at the place we visited on Monday?

A. I didn't see any, no, sir. They were all Thomsons.

(Mr. Stackpole: There were a number there, I understand, and you may have seen them.)

(Mr. Pattison: Am I correct in understanding that your knowledge of electric welding began with the McBerty machine and then you went to the Winfield people and carried it forward with the Winfield machines that were sold by the Winfield people?)

A. Yes, sir, that was the first machine I ever saw.

Cross-examination by MR. FISH:

X-Q. 92. Were you ever associated with the National Electric Welder Company?

A. Yes, sir.

X-Q. 93. When?

A. When it was organized.

X-Q. 94. When was that?

A. I think that was 1911.

X-Q. 95. In 1911?

A. I believe so.

X-Q. 96. Who was associated with you in that company?

A. A man by the name of W. A. Wilson, and Fred P. McBerty and Newton A. Wolcott.

X-Q. 97. How long did you stay with that company?

A. About one year.

X-Q. 98. What was your position in that company?

A. I think I was president.

X-Q. 99. You were president?

A. Yes, sir.

X-Q. 100. Do you know anything about the purchase of this welding machine, Exhibit B, by the National Electric Welder Company?

A. Yes sir.

X-Q. 101. What do you know about it?

A. Of course, I had seen the machine at the Peerless plant, and I knew that Mr. Wolcott, not Mr. Wolcott, but Mr. McBerty, wanted to buy the machine.

X-Q. 102. Do you know why he wanted to buy it?

A. Yes, sir, as a kind of protection to the company.

X-Q. 103. In what respect?

A. To prove that he had made spot welding, or that he had proof that it was the machine that he had done spot welding on.

X-Q. 104. That is, he wanted the custody of the machine as the one he had spot welded on?

A. Yes sir.

X-Q. 105. Is that all you know about as the reason for buying it?

A. I believe so.

X-Q. 106. What do you say?

A. I think so.

X-Q. 107. When did you first see welding on that machine yourself?

A. In 1903.

X-Q. 108. Where was the machine then?

A. At the Peerless Company.

X-Q. 109. You have told the whole story?

A. Yes sir.

X-Q. 110. Did you ever say that machine was bought for the National for the purpose of putting it up as a bluff in connection with this litigation?

A. Not that I remember of.

X-Q. 111. You don't remember of saying that?

A. No, sir.

X-Q. 112. You didn't say it to Mr. Newton A. Smith, or words to that effect?

A. I don't know as I did.

X-Q. 113. Did you say it to Mr. McBerty, that is, the way it was done?

A. I don't think I did.

X-Q. 114. What?

A. No, sir.

X-Q. 115. Do you swear you didn't?

A. Yes sir.

(Mr. Stackpole: May I ask the witness some questions on another point, your Honor?)

(The Court: Yes. There is no objection.)

X-Q. 116. Was it in 1904 you developed this machine with rollers?

A. Yes sir.

X-Q. 117. And afterwards you changed it over to a spot welder?

A. Yes sir.

X-Q. 118. And that spot welder was the first use you had made of a spot welder, made by the Winfield Company?

A. Yes sir.

X-Q. 119. Did you discontinue the use of the rollers?

A. I did temporarily.

X-Q. 120. Temporarily?

A. Yes, sir, that is, we used it off and on with rollers.

X-Q. 121. Did you use the spot welders for the same work, for welding parts of the stove pipe, whatever it was?

A. No.

X-Q. 122. What was the shape of the periphery of the rolls?

A. I think one was flat and one was a little oval, the conductors, that is, the surface.

X-Q. 123. That is all.

Redirect examination by MR. PATTISON :

Re-D. Q. 124. I notice this machine you have produced appears to have only one electrode?

A. Yes sir.

Re-D. Q. 125. How about that missing electrode?

A. I don't know. I imagine it has been lost, as the machine lay around a long time.

Re-D. Q. 126. It would have it on in 1904 when you operated it?

A. Oh, it would have to have it. The hole shows the place for it.

Re-D. Q. 127. And it was between those two electrodes you did the spot welding?

A. Yes sir.

(Mr. Pattison: That is all.)

JOHN S. GILDER.

JOHN S. GILDER, after being duly sworn on behalf of the defendant, testified as follows:

Direct examination by MR. PATTISON :

Question 1. Where do you now live?

Answer. In Warren, Ohio.

Q. 2. How long have you lived there?

A. I have been in Warren, Ohio, most of the time since 1900.

Q. 4. You were with the Warren Electric & Specialty Company in 1900? What did you do?

A. I went to work for the Warren Electric & Specialty Company.

Q. 5. What work did you do in 1900?

A. I went to work in the fan motor department.

Q. 6. Did you know at that time the material of which the blades and spiders were made at the Warren Electric & Specialty Company in 1900?

A. I didn't work on that part of it.

Q. 7. Did you know of what material the fan blades were made at that time?

A. They were brass.

Q. 8. Of what material were the spiders when you went there?

A. If I remember right, they were cast bronze, or bronze.

Q. 9. This was in 1900?

A. Yes sir.

Q. 10. Was any change made in respect to the material for fan blades and spiders after 1900?

A. In 1901 there were pressed steel blades and spiders of iron and steel guards.

Q. 11. What kind of fans were so made?

A. They were called G-1 and G-2, I believe.

Q. 12. Was it as expensive a fan as the brass fan?

A. I don't imagine it was. It was cheaper material.

Q. 13. Did you have anything to do with making the fan guards for this steel-bladed fan?

A. At times I did, yes, sir.

Q. 14. What work did you do on it?

A. I welded some of the rings and arms, whatever you call them.

Q. 15. How did you weld them?

A. On an electric welding machine.

Q. 16. Did you do much of this work?

A. Well, at times I did. I helped out. My work was making brass guards.

Q. 17. Can you give us an estimate, as nearly as you can, of how many electric butt welds you think you made in 1901?

A. That would be difficult to say.

Q. 18. Can you give us some idea?

A. No, I don't believe I could.

Q. 19. Would it run into the hundreds?

A. Oh, yes, I should say it would run into the hundreds. I worked a half day or so at a time.

Q. 20. Did the machine work all right for that purpose?

A. Yes sir.

Q. 21. And what year was that?

A. That was in 1901.

Q. 22. The year after you went with the company?

A. Yes sir.

Q. 23. And you went with the company the first year you came to Warren, in 1900?

A. Yes, sir, the early part of 1900.

Q. 24. The operation of this machine, I suppose, made you familiar with it?

A. Yes sir.

Q. 25. Do you think you would recognize the machine now?

A. I think I would, yes, sir.

Q. 26. Will you please examine this Exhibit B and state what it is?

A. That is the machine, with the exception of those handles or cam levers, as they are called.

Q. 27. Would you say it was this machine you worked on?

A. I should say it was.

Q. 28. That is the machine then that you operated for butt welding in 1901?

A. Yes sir.

Q. 29. Do you know whether any other kind of welding was done on this machine?

A. I saw no other kind of welding done on it.

Q. 30. Did you see any other kind of welding that had been done on it?

A. I saw some fan blades that had been electric welded, that is, spot welded, on to the hubs.

Q. 31. How many do you think you saw?

A. I could not say definitely. I saw them in a crate or tray, as we call them, as they were used for carrying them through the shop and getting them from one place to another.

Q. 32. Did you examine them when you saw them?

A. Yes sir.

Q. 33. To what extent did you examine them?

A. Well, I had them in my hand and looked them over.

Q. 34. For what purpose were the spot welds on the blades?

A. To do away with riveting.

Q. 35. Did that do away with the riveting?

A. Yes sir.

Q. 36. Did they seem to serve the purpose of riveting?

A. They looked all right, yes, sir.

Q. 37. Did you see these blades afterwards?

A. No, sir, I don't remember of seeing them after they were in these trays.

Q. 38. Was this the first electric welding machine you ever saw?

A. Yes sir.

Q. 39. And that attracted your attention?

A. Yes, sir; I had no knowledge at all of the electric welding business.

Q. 40. Did you see any one do any spot welding on this machine?

A. No, sir, I didn't.

Q. 41. When was it you saw these spot-welded blades?

A. I would say it was shortly after the machine came into use, the early part of 1901.

Q. 42. What was the tray used for in the factory of the Warren Electric & Specialty Company?

A. For conveying blades around to the different operations.

(The Court: For assembling purposes?)

(The Witness: Yes, sir.)

Q. 43. Was there as many as a tray full when you saw them?

A. Well, I could not say as to that.

Q. 44. What is your recollection of it?

A. Well, I would say, as near as I can recall, there was more than one, and there might have been a dozen. Somewhere, eight or ten or a dozen, as near as I can remember.

Q. 45. Did this electric welding machine attract any attention in the fan department?

A. Yes, sir, it did at first. It was new to most of us.

Q. 46. How did the spot welding with that attract attention there?

A. Well, it was talked of among the boys.

Q. 47. Was all this done the first year the cheap fans referred to were made?

A. This welding?

Q. 48. Yes.

A. Yes, sir.

(Mr. Pattison: That is all.)

Cross-examination by MR. STACKPOLE:

X-Q. 49. Did you tell your story to Mr. McBerty, about this welding machine in 1913?

A. At the time—at what time?

X-Q. 50. When Mr. Howe was there?

A. Yes, sir.

X-Q. 51. And you told Mr. Howe and Mr. McBerty everything you remembered?

A. To the best of my ability.

X-Q. 52. You covered the entire situation?

A. As near as I could recollect at that time, yes, sir.

X-Q. 53. You disclosed everything you knew at that time?

A. As far as I could recollect, yes, sir.

X-Q. 54. Did you tell Mr. Howe and Mr. McBerty about seeing these welded blades and spiders?

A. Seeing them?

X-Q. 55. Seeing them after they were welded. Did you tell them then you had seen them after they were welded?

A. I don't recollect as to that.

X-Q. 56. Did you tell them about the welded blades and spiders being carried on the trays?

A. I don't remember that.

X-Q. 57. Did you tell them about the boys in the shop talking about it?

A. I could not say as to that.

X-Q. 58. In the last year or two or three have you discussed the matter of what you saw in 1901, concerning the work, with anybody?

A. Yes, sir.

X-Q. 59. With whom?

A. With Mr. Pattison and Mr. Church.

X-Q. 60. With Mr. McBerty?

A. It was in his presence.

X-Q. 61. General consultation?

A. Yes, sir.

X-Q. 62. Did any of them show you these catalogs, or this catalog of 1901?

A. I believe I did see that catalog.

X-Q. 63. At that time when you had that consultation?

A. I am not sure it was just at that time, but I remember of seeing one of the catalogs.

X-Q. 64. When did you have this consultation?

A. I could not give you the exact date.

X-Q. 65. No. But what year?

A. When?

X-Q. 66. When Mr. McBerty was present?

A. I should say it was a couple of years ago.

X-Q. 67. Nineteen seventeen?

A. Yes, sir.

X-Q. 68. Not earlier than that?

A. No, sir.

X-Q. 69. And you went over the entire situation at that time with Mr. McBerty and with Mr. Pattison?

A. Yes, sir.

X-Q. 70. And Mr. McBerty was present?

A. Yes, sir.

X-Q. 71. Did you make an affidavit in 1913 which you gave to Mr. Howe?

A. I believe that is about the date, yes, sir.

X-Q. 72. Was Mr. McBerty present?

A. Yes, sir.

X-Q. 73. And you went over the affidavit with him?

A. Yes, sir.

X-Q. 74. Did you in that affidavit, if you recollect, refer to seeing these spot-welded blades and spiders after they were welded?

A. I could not say.

X-Q. 75. Why didn't you put that in?

A. I was called rather hasty over there to talk with these gentlemen, and it had been quite a while since I had seen any of this work, these things; after I got thinking it over, it came back to my mind.

X-Q. 76. Did Mr. McBerty at that time, that is, in 1913, suggest that perhaps you had seen some of these fan blades welded after they had been welded?

A. I don't remember as to that.

X-Q. 77. Is this your signature?

A. (Examining). Yes, sir, it looks—

X-Q. 79. Is this the affidavit that you gave to Mr. Howe in 1913?

A. Read it over. My eyes are on the bum.

X-Q. 80. I will read the entire affidavit: (Reading)

"In the United States District Court, District of Massachusetts.

In Equity, on Harmatta Patent No. 1,046,066.

Thomson Electric Welding Company, et al., vs. Barney & Berry, Incorporated.

Affidavit.

State of Ohio, County of Trumbull, ss.:

John S. Gilder, being duly sworn, deposes and says as follows:

My name is John S. Gilder. I am 38 years of age and reside in Warren, Ohio. I am at present employed by the Enterprise Electric Company at Warren, Ohio, as a transformer assembler.

Early in the year 1900 I came from the home of my parents in Kinsman, Ohio, and entered the employ of the Warren Electric & Specialty Co. in Warren, Ohio. This was in the early part of the year 1900, in January or February, because I remember that it was cold and wintry.

When I first entered the employ of the Warren Electric & Specialty Co. in 1900, the company was making its fan guards of brass. The rings of these guards at first had their ends secured together by inserting them in a sleeve and then securing them with solder.

Later it was the practice to dowel the ends of the rings together and then sweat them.

The next season, or the one after, that is, in the year 1901 or 1902, the manufacture of iron fan guards was begun by the company. At first they tried brazing the ends of the iron rings for the guards together, but that was not satisfactory, and the welding of the iron guard rings by electricity was begun.

This electric welding was started either the same season that the use of iron fan guards was begun, that is, in 1901 or 1902, or it may have been the next season after that. I have given these dates entirely from recollection and have no papers or memoranda by which I can verify them.

I recall in a general way seeing the electric welding machine which was used for welding the iron fan guards at the time I have mentioned. I recall this machine in a general way, but could not go into details regarding it. I recall that there were two short handles for pushing the clamp jaws together to secure the work in them, and there were two larger handles for pushing the clamps toward each other to bring the stock together to weld it. My work at the time was that of general utility man. I helped form the pieces for the guards in the shop and sometimes would assist in the welding. The only kind of welding which I remember seeing done on the machine at that time was the welding together of the ends of the stock to make fan guard rings. It was only occasionally, however that I was in a position to know what kind of work was being done on the machine, so that other kinds of work and characters of welds may have been made which I knew nothing about.

I have, on October 7th, 1913, examined a welding machine at the works of the National Electric Welder Co. at Warren, Ohio, and while I did not have sufficient to do with the ma-

McElray.

chine so that all details were impressed on my mind, this appears to be the same machine that I saw used at the factory of the Warren Electric & Specialty Co. for welding the rings of iron guards as I have described.

(Signed) JOHN S. GILDER.

Subscribed and sworn to before me this 10th day of October, A. D. 1913.

(Signed) C. E. STEPHENS,

Notary Public.

(Seal) Notarial Seal. Trumbull County, Ohio."

Is that your affidavit?

A. Yes, sir.

X-Q. 81. Do you remember of signing and swearing to it before Mr. Stephens, a notary public?

A. Yes, sir.

X-Q. 82. At Warren?

A. Yes, sir, when he came over to the office of the Enterprise Electric Company, where I was working.

X-Q. 83. Do you remember who wrote out this affidavit?

A. I don't.

X-Q. 84. You were not present when it was being written out?

A. I don't believe I was, for they told me I could go back at my work.

X-Q. 85. The affidavit is true?

A. True, except as to age. That was six years ago; I was 40 years old; I believe I made a mistake in stating my age to Mr. McBerty.

X-Q. 86. In this affidavit the age was filled in with——

A. I think Mr. Stephens did that when I swore to the affidavit.

X-Q. 87. And this affidavit contains everything you remembered at that time?

A. At that time, yes, sir.

(Mr. Stackpole: Plaintiff offers in evidence as Plaintiff's Exhibit No. 29, as part of the cross-examination of Mr. Gilder.)

McELRAY.

McELRAY, after being duly sworn on behalf of the defendant, testified as follows:

Examined by MR. PATTISON:

Question 1. Where do you live?

Answer. Youngstown, Ohio.

Q. 2. What is your present occupation?

A. Assistant chief superintendent of the Carnegie Steel Company, Youngstown, Ohio.

Q. 3. Are you acquainted with a Mr. Smith, known as Captain Smith?

A. Yes, sir.

Q. 4. When did you first meet him?

A. January, 1905.

Q. 5. Where?

A. At the works of the Carnegie Steel Company.

Q. 6. What was Mr. Smith doing there?

A. He was employed as one of the shop men.

Q. 7. In connection with electric work?

A. In connection with electric repair work.

Q. 8. Mr. Smith has testified in this case while at the Carnegie Steel Works he built an electric welding machine. Do you know anything about that?

A. Yes, he did.

Q. 9. Did you have anything to do with it?

A. Yes, I helped him to build it.

Q. 10. What is your recollection of the construction of that machine?

A. You mean——

Q. 11. The welding machine.

A. You mean the description?

Q. 12. Of the machine—its construction.

A. Well, we used what we could find around the shop to build it with, and finally of the Westinghouse type of transformer. We used the iron that we made the primary coils of, and would be made the same shape as the Westinghouse coils would be made to fit the iron. The secondary was wound with heavy copper strip. In making the primary we used it so that we could use it for standard stuff that we worked on, and we used one-thirty-second seven-eighths copper wire, and the bulk of it would be copper terminals, seven-eighths inch, three inches wide.

Q. 13. What led to the making of this machine?

A. Curiosity, as far as I had anything to do with it. When Mr. Smith came to work for us, we were, or at least I was, new in the electric game, and hadn't had the opportunity of seeing very much electric apparatus, only what we had in our work, and at lunch time we would talk the different things over, and what the transitory workers had seen, and in the conversation Mr. Smith told us about electric welding and electric welding machines, and we asked him if he could make one, and he said he could, and I think I was one of the men that brought it up before the chief electrician, and the chief electrician gave us permission to go ahead.

Q. 14. What made Mr. Smith say he could build an electric welding machine?

A. He told us he had used one at the Warren plant where he worked.

Q. 15. Did he say where he used one?

A. I am under the impression it was at the Peerless Electric

Company's plant.

Q. 16. I show you a blueprint and ask you whether that represents in a general way the machine Mr. Smith made at the Carnegie Works?

A. Yes, sir, I would say that would be. I could probably make a drawing of it from memory if it was put to me to do.

(Mr. Pattison: The blueprint shown the witness is offered as Defendant's Exhibit G, Smith Welder.)

Q. 17. What kind of work was this welding machine used for at the Carnegie Works?

A. The real object of the machine was to eliminate a lot of hard work and poor work that we were doing on the construction of coils, and brake stops on motors. We were very economical in those days, and when the wires would burn in two, we would splice them; sometimes by wrapping wire around, and sometimes by making a sleeve, and when we made a sleeve, we butted them and when we wrapped them, we lapped them. In making a joint, we tried to make it come at the end of the coil, because if it came in the middle it might break, and sometimes in going over the bend of the coil it would break, and made a very poor job at times, and it was an inconvenient thing to handle, and Mr. Smith told us about this welding machine, and that was the thing that eliminated that trouble, and would be of the greatest convenience to us if we could get something to weld copper wires together. When we had a machine built, we found it was not big enough, had not the capacity to do that work. We tried it, and tried it very diligently at that time.

Q. 18. You mean it hadn't the capacity to weld copper wires together?

A. Yes, sir.

Q. 19. Was any welding done with it at all?

A. Yes, we had another job that cost us a lot of inconvenience, and that was making bolts or headers. We used No. 13 bolts to tie the different of resistance together. The bolts could not be bought at that time, 13 inches long, so we had to make it from a three-eighths iron rod. And it was a very long job, threading a round the steel, and not very successful all the time, so when we got this welder made, we conceived the idea of buying seven-eighths bolts and cutting the heads off and putting them on this machine to butt weld them, and we did it successfully.

Q. 20. Do you remember any tests made of butt welds to ascertain strength?

A. Yes, sir. When we had these made, we told our blacksmith at that time what we were going to do, and he was very skeptical; he said it could not be done. So we told him how we were going to do it, and he was on the job to see us do it, and he made the test of its strength; he put it in a vise himself and bent it back and forth,

until it broke, and it broke, as I remember it, half an inch away from the weld.

Q. 21. Was this machine used to weld any other things?

A. Yes, sir. Another thing we did at our work was to make pressed ribbon resistance, we called it P. R., as it was named at that time. After we had this machine going, doing butt welding, Mr. Smith conceived the idea to spot weld those ribbons, and we did that very successfully for some time. In fact, we continued to do it until we began to discontinue the use of P. R. resistance for a different type of resistance.

Q. 22. Did that spot type of welding go into commercial use?

A. Yes, sir.

Q. 23. When did it first go into commercial use?

A. Immediately after we made the weld.

Q. 24. When was that?

A. That was in 1905.

Q. 25. Will you state whether it was the early or latter part of the year 1905?

A. I would say we had the machine finished, built, before Mr. Smith had been with us six months.

Q. 26. When did he come there?

A. In January, 1905.

Q. 27. Can you produce an illustrative sample of this spot welding that was done?

A. Yes, I can (producing).

Q. 28. Is this a fair illustration of the spot welding that was done on the Smith machine?

A. I would say it was a far nicer looking job from a mechanical standpoint.

X-Q. 29. When was this made?

A. That was done this morning.

Q. 30. And this is the kind of work that went into commercial use, as you stated?

A. Yes, sir, that is the exact size of the ribbon we used, and still continue to use it for other purposes in our work.

Q. 31. What was the resistance?

A. The resistance used in starting that type of motor is the same resistance that was used practically on most street cars at that time, in starting motors of any type.

Q. 32. Did you find this spot welding successfully performed that season?

A. I never found one that had given us any trouble by burning open.

Q. 33. And had the ribbon given you any trouble before?

A. Continual trouble, yes, sir.

Q. 34. Is this Smith machine in existence now?

A. It is not.

Q. 35. When was the last time you saw it?

A. It was really destroyed at the time of the flood that we had in that section of the country, and it laid in our shop cellar until we went to clean house, you might say, and we looked at the machine, and debated over it, and decided to scrap it. We have been sorry many times since that we did it. We still can find practical uses for it now more than we could at that time.

(Mr. Fish: When was that large one made?)

(The Court: Six years ago in March.)

(Mr. Pattison: Sample offered as Defendant's Exhibit 71, Illustrative Work Done on Smith Electric Welder.)

Q. 36. That is all.

Cross-examination by MR. SRACKPOLE:

X-Q. 37. On what kind of machine was this model made this morning?

A. On a Winfield machine.

X-Q. 38. In Detroit?

A. Yes, sir.

X-Q. 39. In what factory?

A. The—I had never seen the plant before. I don't know the exact name.

X-Q. 40. This Smith machine was originally intended for butt welding copper rods, and it failed on that?

A. On welding copper wire, yes, it failed on that.

X-Q. 41. And then it was used to butt weld the ends of these two bolts?

A. Yes, sir.

X-Q. 42. Was that successful?

A. Very successful.

X-Q. 43. And later, it was used to spot weld the ends of these iron ribbons? Is that the idea?

A. Yes, sir.

X-Q. 44. How much later was it used for the butt welding of ends of the bolts?

A. I would say at the same time, we were doing the same work all the time. I would not say which was done first, but if my memory serves me right, the bolts were butt welded first, more for curiosity through the mechanical department; our blacksmith doubted our ability to do it.

X-Q. 45. The bolts were spot welded first?

A. I could not remember that. I think so, but I cannot remember distinctly.

X-Q. 46. That was a good many years ago?

A. That was in 1905.

FRED G. CARTER.

FRED G. CARTER, after being duly sworn on behalf of the defendant, testified as follows:

Examined by MR. PATTISON:

Question 1. Where are you now living, Mr. Carter?

Answer. Warren, Ohio.

Q. 2. What is your business?

A. Machinist.

Q. 3. Where are you now working?

A. The Trumbull Steel Company, Warren, Ohio.

Q. 4. Did you ever work for the Winfield Manufacturing Company?

A. I did, sir.

Q. 5. Did you know Mr. Albert Taylor?

A. I knew Mr. Bert Taylor.

Q. 6. Was he at the Winfield Company while you were there?

A. Yes, sir, he was.

Q. 7. Do you know anything about any welding machine he had made?

A. Yes, sir, I had some experience on the welding machine Mr. Taylor made.

Q. 8. When was this?

A. As near as I can recollect, it was the year 1905.

Q. 9. When did you go with the Winfield Company?

A. I first went with the Winfield Company in 1904, the summer.

Q. 10. The summer of 1904?

A. Yes, sir.

Q. 11. What was the first work you remember of on the welding machine at the Winfield Company?

A. The first work I can remember was butt welding.

Q. 12. Does this drawing illustrate anything you saw at that time? (referring to Defendant's Exhibit 69).

A. There is a drawing on this sheet that well represents the first machine I did work on.

Q. 13. What kind of work was done on this machine?

A. The work done on this machine was butt welding the parts of elbows, bent elbows, one-piece elbow.

Q. 14. Was any other kind of work done on this machine?

A. Yes, sir; there was quite a bit of experimental work done on that machine.

Q. 15. What did that relate to?

A. It related to spot welds and the spot welding and butt welding.

Q. 16. On what?

A. On a butt welding machine.

Q. 17. What did you weld?

A. Small strips of sheet steel, as near as I can recollect.

Q. 18. Did you do any work on the machine referred to on this sketch?

A. Yes, sir.

Q. 19. What work did you do on this machine?

A. As near as I can recollect, I made the handle that operates the sliding head on this machine.

Q. 20. Did you operate it?

A. I have operated that machine.

Q. 21. What kind of welds did you make on it?

A. I made butt welds, and I have made spot welds on it.

Q. 22. What did you spot weld?

A. Small pieces of steel parts of elbows.

Q. 23. Did you ever see that machine before you?

A. Yes, sir, I have seen that machine.

Q. 24. Where did you see it?

A. At the plant of the Winfield Manufacturing Company at Warren, Ohio.

Q. 25. Did you see it operated?

A. I did.

Q. 26. This Exhibit 68, did you operate it?

A. I recall I did operate that machine then in an experimental way.

Q. 27. What did you do on that machine?

A. I have welded small pieces of steel, parts of elbows, in an experimental way.

Q. 28. Did it weld good?

A. It certainly did.

Q. 29. Do you know whether Mr. Taylor did any further work on electric welding machines at the Winfield Company?

A. I know that Mr. Taylor continued in that line of work.

Q. 30. When did you leave the Winfield plant?

A. To the best of my recollection, it was 1907. I am not positive.

Q. 31. Were you closely connected with the electric welder work all the time you were there?

A. I was.

Q. 32. In what way?

A. Being a machinist, I had considerable to do with the different machines made, and so forth.

Q. 33. What character of machine followed this Exhibit 68?

A. I would say the spot welder.

Q. 34. What was the general construction of it?

A. The general construction of the spot welder we completed was like this machine, I would say a six-inch machine, and there has been very little improvement, with the exception of the base it stood on and the operating switch.

Q. 35. I hand you a sketch and will ask you whether that represented the machine according to your recollection?

A. To the best of my recollection, that is the exact duplicate.

Q. 36. What was done with that machine?

A. I think that machine was put on the market. I am not positive. There was some work done with it in the shop.

Q. 37. The exhibit referred to is Defendant's Exhibit 70. Were other machines than the one like this Exhibit 70 built there?

A. There were.

Q. 38. Did you do any work on them?

A. I did.

Q. 39. Were any machines offered for sale while you were there?

A. Yes, sir, there were.

Q. 40. Were any sold while you were there?

A. To the best of my knowledge; they left the shop.

Q. 41. When you left there in 1907, were they still engaged in the manufacture of spot welders?

A. They were.

Q. 42. Do you know whether the Winfield Company used spot welders in the manufacture of their product?

A. They did at one time.

Q. 43. What did they use it for?

A. Welding seams and elbows.

Q. 44. "At one time." When was that?

A. That was the year 1906, I will say. I am not positive of that. It may have been before that.

Q. 45. Did any of this spot welding work go out to the trade?

A. Yes, sir.

Q. 46. What were the articles that were welded?

A. Stove-pipe elbows.

Q. 47. Did you see many of them manufactured for the market?

A. I did, quite a few.

Q. 48. In 1906?

A. Yes, sir.

Q. 49. Do you think it was not earlier than that?

A. It might have been earlier, possibly.

Q. 50. Then you were closely connected with Mr. Taylor's work?

A. I was.

Q. 51. Did he tell you where he first learned about welders?

A. No, sir, not to my recollection.

(Mr. Pattison: That is all.)

No cross-examination.

(The Court: Call the next witness.)

(Mr. Church: There is a witness on his way here.)

(The Court: We have at least an hour left.)

(Mr. Church: May I ask we take a recess for a few minutes?)

(The Court: Yes. I would like to get out of the building by at least 25 minutes to four.)

EVRAH C. LIPPS.

EVRAH C. LIPPS, after being duly sworn on behalf of the defendant, testified as follows:

Direct examination by MR. PATTISON:

Question 1. Your full name?

Answer. Evrah C. Lipps.

Q. 2. Where do you live?

A. Ninety-eight and one-half Moran Street, Detroit.

Q. 3. Where are you now working?

A. At the Packard Motor Car Company.

Q. 4. What are your duties there?

A. Foreman in the tool room.

Q. 5. How long have you been with them?

A. Nine years the fourth of last April.

Q. 6. Do you know Mr. Fred P. McBerty of Warren, Ohio?

A. Yes, sir.

Q. 7. When did you meet him?

A. In 1900. I don't know just exactly when first. I believe it was the year 1900 that I first saw him, as near as I can recollect.

Q. 8. Did you work at the Warren Electric & Specialty Company at any time?

A. Yes, sir.

Q. 9. When did you leave the employment of that company?

A. In 1901.

Q. 10. What time in 1901?

A. In June.

Q. 11. While you were working for the Warren Electric & Specialty Company, did you see an electric welder there?

A. Yes, sir.

Q. 12. Did you do any work on it?

A. Yes, sir. That is, it wasn't my duty to do the operating of it, but I saw the machine there all the time.

Q. 13. Did you do any welding on it?

A. I have occasionally, yes, sir, but not as a regular business.

Q. 14. What kind of welding did you do on it?

A. Butt welding, welding rings together.

Q. 15. Did you do any other kind of welding on it?

A. I cannot remember what welding was done on it, but there was other welding besides the butt welding. I know we welded fan blades.

Q. 16. What were they welded to?

A. To the center member.

Q. 17. Did you see any of these fan blades welded to the center members?

A. I don't recollect of seeing the fan blades themselves welded, but I saw them after they were welded.

Q. 18. You didn't see the work done, but you saw the fan blades after they were finished?

A. I saw the boys working on them. It has been so long ago I never paid any attention to it any more than that.

Q. 19. This was, of course, before you left there in June, 1901?

A. Yes, sir.

Q. 20. Do you think you could recognize that welder machine?

A. I think I would.

Q. 21. Examine this machine over here and see what you think it is.

A. Yes, sir, that is the machine.

Q. 22. Where did you see it?

A. The first time I saw it was at the Warren Electric & Specialty Company's factory.

Q. 23. That was before you left there in June, 1901?

A. Yes, sir.

Q. 24. Did you see any completed fan blades that were welded on this machine?

A. You mean on the fans, or do you mean——

Q. 25. I mean the four parts.

A. Yes, sir.

Q. 26. Did you see any put on the completed fan?

A. I saw them working on them. They would make a piece, the cross bars, and weld them on afterwards.

(By the Court):

Q. 27. You have no recollection of seeing any completed fans?

A. Oh, yes.

Q. 28. With the welds on? You have seen the assembled fans?

A. Not the assembled fans, but the four blades on.

Q. 29. The four blades on them?

A. Yes, sir.

(By Mr. Pattison):

Q. 30. I show you a sketch and ask you if you have seen that before?

A. Yes, sir. I believe, as nearly as I can see, that is the original sketch that machine was made after.

(The Court: Did you ever see the sketch before?)

(The Witness: Yes, sir, I saw the sketch itself.)

Q. 31. At the Warren factory?

A. Yes, sir.

(Mr. Pattison: This is the sketch, Exhibit M, attached to McBerty's affidavit, Exhibit 28.)

Q. 32. How did you happen to see that sketch at the Warrner Electric & Specialty Company's place?

A. Well, now, it was in the process of construction. I saw what was going on, the different machines, and Mr. McBerty would show us different methods and maybe make a sketch, and take them in the machine shop to have them worked up, and in my duty I would be from one place to another, and would naturally see them. I worked there some time, and saw a great many of the parts, and worked on them. It is so long ago it is now a hard matter to recollect the actual process of putting those parts together, and what I did make myself, and what I assembled, so long ago.

Q. 33. Did you, as a matter of fact, make any of the parts of that machine?

A. I assisted in making them, yes, sir.

Q. 34. Whom did you assist in making them?

A. Let me see—Mr. McBerty himself was one, and I think Mr. McDonald—no, it wasn't Mr. McDonald.

Q. 35. Maybe you can remember some of the gentlemen here in the room. Do you remember Mr. Powers of the Warren Electric & Specialty Company?

A. John Powers, yes, sir.

Q. 36. Jasper Powers?

A. Jasper Powers, yes, sir.

Q. 37. Did he help about this machine?

A. He was the man; I could not think of his name. I was trying to recall him. He was the foreman of the machine shop.

Q. 38. How many of these completed fan blades do you think you saw spot welded?

A. I could not tell you how many. I know we saw some. It was common talk in the shop, making them that way.

Q. 39. You left that company in June, 1901?

A. Yes, sir.

(Mr. Pattison: That is all.)

Cross-examination by MR. STACKPOLE:

X-Q. 40. Are you sure it is 1901 that you left the employ of that company?

A. Why, as near as I can recollect, it was.

X-Q. 41. Wasn't it 1900?

A. No, I think it was June. You see, I had a contract. In fact, I have that contract at my house, and when that expired, I left the employ and went into business for myself in Cleveland.

X-Q. 42. And was not that 1900?

A. If Mr. McBerty has my time book here, where I kept the dates of the men working there, I could tell. That would show the exact time.

X-Q. 43. Well, after you went to Cleveland, did you go back to Warren?

A. Yes, sir.

X-Q. 44. Into whose employ did you enter there?

A. From Cleveland I came back and went in with the Trumbull Manufacturing Company for about a month, awaiting an opening to come back into the old plant.

X-Q. 45. And did you finally go back into the old plant?

A. Yes, sir.

X-Q. 46. What year was that, if you remember.

A. Nineteen hundred and two, I think.

X-Q. 47. Nineteen hundred and two?

A. Yes, sir. I was away just a year. I left Warren in 1901 and I came back in September, 1902.

X-Q. 48. Do you recall a visit made to you by a Mr. Howe, and a Mr. McBerty in 1913, and the making of an adffiaivit at that time?

A. Yes, sir.

X-Q. 49. And telling them all you knew about this matter of the spot welder?

A. Yes, sir.

X-Q. 50. You told him everything you knew then?

A. I told them all I could recollect at that time, yes, sir.

X-Q. 51. Did you give them any specimens or exhibits or anything else at that time?

A. They had all the exhibits that were available.

X-Q. 52. Did you make an affidavit?

A. Yes, sir.

X-Q. 53. Would you recognize that if you saw it now?

A. I think I would.

X-Q. 54. Do you remember whether you said in that affidavit:

"I left the employ of the Warren Electric & Specialty Company in the summer of 1900, and went to Cleveland, Ohio, where I engaged in the manufacture of electric fans on my account. Attached hereto is the time book (marked Exhibit 'G') which I kept during this work in Cleveland, in which time time spent is marked beginning on August 20th, 1900, and continuing until April 29th, 1901, when I discontinued my Cleveland enterprise and went back to Warren, Ohio. I at first went to work for the Trumbull Manufacturing Company, where I remained but a few weeks."

Do you recall that?

A. Yes, sir. To get the exact date is a difficult matter, unless you

have something to refer to. That is the reason I fix that, was to have my old time book, and having given that up, I have no diary or notes or kept anything of that kind, that I could tell from, so I couldn't tell.

X-Q. 55 (Showing book). Is this your time book?

A. Yes, sir.

X-Q. 56. Does that help you in fixing the year?

A. Yes, I am in error. Has this been altered in any way?

X-Q. 57. Not that I know of.

A. This is 1900.

X-Q. Yes, I think you made a mistake in your testimony.

A. That is what I told you. It has been so long ago that all I could recollect from is previous data.

(Mr. Stackpole: I think we might save time if I simply put the affidavit in and asked him if he made the affidavit, and what is in it, and we can read it later.

(The Witness: I was under the impression it was 1901.)

(The Court: This is your time book?)

(The Witness: Yes, sir, the book I had when I was doing some experimental work in Cleveland. I was building a new fan entirely. This was just a time book I kept there with the dates on, and it happened I laid that aside. and I were working together, and we kept a record of each day of the work each of us were on. That is the way I fix the date in my mind.)

X-Q. 59. I show you an affidavit entitled: "In the United States District Court, District of Massachusetts. Thomson Electric Welding Company, et al., vs. Barney & Berry, Incorporated." Is that your signature to that affidavit?

A. Yes, sir.

X-Q. 60. Did you swear to that affidavit in October, 1913, as shown by that jurat?

A. I don't know what date it was, sir.

(Mr. Stackpole: That book goes in with the affidavit, does it not?)

(Mr. Church: Yes.)

X-Q. 61. Will you look that affidavit over and see if you recognize that as your affidavit made at that time?

A. I have had no occasion to remember that. I had nothing to refresh my mind on, and it is hard to accurately remember the dates. Let me read this. This was made when I had my copies of everything so that I could refer to it, and as I stated before,

when I go to remember these things, it is a very difficult matter to place dates. 1898, you see, is when I started to work with them. It was 1899, I think it was, the year after he came back to work there. He was not there when I first came there, when I first came to the Warren Electric Company, McBerty was not there. Then he came in afterwards. It is a hard matter to remember that. It was just a short time afterwards. Then you have a copy of my original contract?

X-Q. 62. It is attached thereto. You may look at it and see.

A. I would look at it to fix the date. The date of that contract would show the exact date.

(Mr. Fish: Let me find it for you. That is the contract there. The matter of dates is not of large consequence. I have no doubt the dates in your affidavit are right.)

A. By carrying this book, carrying one date after another, I could tell. I was with them there two years. That would be 1900. I was with them at that time experimenting. 1898, March 2nd, that is right, because I came there—well, I came there on the 25th of January, and this contract was made out the 2nd subsequent to the 25th of January.

(Mr. Stackpole: The dates are not of so much importance as whether you recognize that affidavit as the one you signed.)

A. I don't recollect that part of it being in there. That is right. You see, everybody was working with that machine.

X-Q. 63. Is this your affidavit? That is the question.

A. Yes, sir; yes, sir.

(The Court: That is all we want to know, whether that is your affidavit or not.)

A. Yes, sir.

X-Q. 64. You gave the information contained in that affidavit to Mr. Howe in Mr. McBerty's presence?

A. Yes, sir.

X-Q. 65. In that affidavit do you recollect giving him this information:

"When I was working with the Trumbull Company in 1901, as I have referred to, I frequently went to the works of the Warren Electric & Specialty Company to see Mr. Fred P. McBerty, with whom I was very friendly, and during these visits I saw an electric welding machine which was arranged as shown in the sketch given to Mr. McBerty last December and in the Exhibit 'A' attached to Brown's affidavit above referred to. At the time of my visit to Mr. McBerty in 1901 this

machine was used for butt-welding the rings of fan guards and I recall distinctly that on one of my visits I found Mr. McBerty changing the transformer which supplied current to the machine. The reason for this being that the transformer which had been used was not of large enough capacity to supply the current for welding the inner fan rings, so that the transformer became over-heated and the change consisted in putting in a transformer of large capacity so that sufficient current could be supplied”?

Is that correct?

A. He was putting in a new transformer, yes, sir.

X-Q. 66. The question is whether that statement there is correct. Is that statement correct as I read that?

A. As nearly as I could judge from it, yes, sir.

X-Q. 67. Do you recollect this sample attached to the affidavit?

A. I could not recall that. It looks very much like it. We had so many of those pieces laying around there, whether that is one or not, I could not say. It looks very much like it. In fact, I would say that it was, as near as I could judge, because the way they make the welds now is by bringing a heavier pressure on them, and they are dented in more.

X-Q. 68. Do you recall in that machine, in the case of the spot welded blades, that the blades were punched for rivet holes?

A. Originally, we riveted all of them.

X-Q. 69. And the blades were punched for rivet holes?

A. Yes, sir.

X-Q. 70. And in the four-bladed welded device, were they similar in character and size to Defendant's Exhibit H that you saw?

A. Very similar to that. It worked on that same principle exactly.

X-Q. 71. Now do you recall that the spot welding was not adopted as a commercial method of making those blades by the Warren Electric Company in 1901?

A. Yes, sir.

X-Q. 72. Do you know the reason why?

A. I could not tell you any more than it was a new thing, and they were a little skeptical about going into anything they were not thoroughly familiar with.

X-Q. 73. Do you recall the use of electrodes that were bent up in that machine?

A. Bent up in what way?

X-Q. 74. Put in the—well, I don't know. I will read what you say:

“I distinctly remember that at that time the space between the clamp arms 3 and 4 was not sufficiently deep to permit the sheets, to be welded together, to extend sufficiently low-

down when placed between the electrodes 31 and 32 when these electrodes were straight, and so we bent the ends of these electrodes upwardly so as to allow the sheets of metal to enter between the electrodes to a sufficient extent to place the weld at the spot desired."

That was done?

A. Yes, sir.

X-Q. 75. You recall that?

A. Yes, sir. You will notice that machine set on a different base from what you have got it attached there to now. It was on a bench.

X-Q. 76. Did it stick out as far as it does now?

A. It had been altered repeatedly. When first made, it set down.

X-Q. 77. Covered the whole bench?

A. Yes, sir.

X-Q. 78. Didn't stick out at all?

A. It didn't stick out at all first.

X-Q. 79. Later, you say it was moved out?

A. Yes, sir.

X-Q. 80. Do you recall in the original machine the fibre between the two base plates ran the whole length?

A. Yes, sir. That is why we could not get a sheet in between.

X-Q. 81. Did you tell Mr. Howe at that time that you had seen complete four-bladed welded spiders?

A. Very similar to that.

X-Q. 82. Did you tell Mr. Howe that?

A. I think I did, yes, sir.

X-Q. 83. Did you tell him you saw this going through the factory?

A. They were not going through the commercial part of it, no.

X-Q. 84. They were not?

A. No.

X-Q. 85. Just experimental?

A. Just experimental, yes, sir.

(Mr. Stackpole: We offer in evidence Mr. Lipps' affidavit as Plaintiff's Exhibit 30. I would like to have the Clerk mark this at once.)

(The Court: Yes, bring the clerk in to have them marked.)

(Mr. Stackpole: We would like these two marked, because they are important. I put the number up in the corner, and this should be attached.)

X-Q. 86. Do you recognize the exhibits attached to this affidavit, the contract between yourself and the Warren Electric & Specialty Company, and the other exhibits?

A. That was where we started our dating.

X-Q. 87. You recognize that exhibit?

A. Yes, sir.

X-Q. 88. Do you recognize that telegram that follows after that?

A. Yes, sir. I was down in West Virginia.

X-Q. 89. Do you recognize the next exhibit, another telegram?

A. Yes, sir.

X-Q. 90. Do you recognize the next one, which is a drawing?

A. That is one of them; that is the original.

X-Q. 91. That is the original, is it?

A. I think so. Mr. Powers—

X-Q. 92. When was that made?

A. Well, it was made before I went to Cleveland.

(The Court: Here is the Clerk. Now, Mr. Voorheis, there are several exhibits counsel want you to initial and mark at once. You may look at their original affidavits and at the same time you may include Defendant's Exhibit M, and give it particular care. I suggest you mark those exhibits and put them all in one package.)

(Clerk Voorheis: I will care for them. They will all go in one locker together. They will be under lock.)

X-Q. 93. This exhibit is correct in its statement of fact?

A. As near as I can remember. I have not read it all. As near as I could remember at that time. It was brought up to date, those other occurrences, so that I could bring one following the other. So that I knew at that time, but perhaps not so clearly now.

X-Q. 94. I would like to have your present recollection, whether you think that affidavit is correct?

A. I think it is correct, yes, sir.

X-Q. 95. That is all.

(The Court: Any re-examination?)

Redirect examination by MR. PATTISON:

Re-D. Q. 96. Do you know Mr. E. B. Craft?

A. I knew him, yes, sir.

Re-D. Q. 97. Was he at the Warren Electric & Specialty Company while you were there?

A. He was there, yes, sir.

Re-D. Q. 98. You were working at the same time he was?

A. Yes, sir.

(Mr. Pattison: That is all.)

(Mr. Stackpole: That is all, your Honor.)

(Mr. Church: That is all we have at this time.)

(The Court: I have about 17 minutes at your service.)

(Mr. Stackpole: It will not be worth while to enter upon anything further at this time.)

UNITED STATES DISTRICT COURT

EASTERN DISTRICT OF MICHIGAN

SOUTHERN DIVISION.

THOMSON SPOT WELDER COMPANY, Plaintiff.

vs.

FORD MOTOR COMPANY, Defendant.

In Equity. On Harmatta Patent No. 1,046,066.

Deposition of Francis S. Maguire, taken in behalf of the defendant, at the office of Messrs. Church & Church, 604 McGill Building, Washington, D. C., on the 28th day of May, 1919, before Thomas Durant, a notary public in and for the District of Columbia, pursuant to notice.

Present: Melville Church, Esq., in behalf of Defendant. H. M. Holmes, Esq., in behalf of Plaintiff.

FRANCIS S. MAGUIRE.

FRANCIS S. MAGUIRE, a witness produced in behalf of defendant, having been duly sworn, deposes and says, in answer to questions propounded to him by Mr. Church, counsel for the defendant, as follows:

Question 1. Please state your name, age, residence and occupation.

Answer. Francis S. Maguire; age, 37; Washington, D. C.; patent lawyer.

Q. 2. How long have you been engaged in the patent law business?

A. For the past fifteen years.

Q. 3. And how long have you been a member of the Bar?

A. Since 1904.

Q. 4. You were formerly associated in business with the late

J. Nota McGill, Esq., of this city, were you not?

A. I was.

Q. 5. During what period were you so associated with him?

A. From about 1899 through 1915.

Q. 6. When did Mr. McGill die?

A. October 16, 1915.

Q. 7. On his death, who succeeded to his business and became the custodian of his papers and files?

A. The firm of McGill & Maguire, of which I am a member.

Q. 8. What is your partner's name?

A. Grafton L. McGill.

Q. 9. And what relation did he bear to J. Nota McGill?

A. He was a brother of the late J. Nota McGill?

Q. 10. Please examine the paper I now show you and state, if you know, what it is and where it came from?

A. It is a letter from the National Electric Welder Company, dated April 20, 1914, addressed to J. Nota McGill, and produced from the files of McGill & Maguire.

Q. 11. How is that letter subscribed?

A. The National Elec. Welder Co., per F. P. McBerty, Sec. & Treas.

Q. 12. Are you familiar with the signature of F. P. McBerty, who appears to have signed this letter as secretary and treasurer of the National Electric Welder Co., and if so state whether or not you recognize the written signature forming part of this subscription as his?

A. I am familiar with the signature of Mr. F. P. McBerty, who signed this letter as secretary and treasurer and I recognize the signature as that of Mr. McBerty.

(Mr. Holmes: This question and answer are objected to as immaterial and irrelevant and as intended to prove a document by improper methods and by secondary evidence, no proof having been offered as to why this document cannot be proved by first hand evidence of the writer.)

Q. 13. I note on the face of this letter in the upper left hand corner, the following notation in pencil "4/22/14." State, if you know, what that indicates, and who made it?

(Mr. Holmes: Same objection.)

A. The notation is in the handwriting of the late J. Nota McGill and indicates the date of the reply to the letter of the National Electric Welder Company, it having been the custom of the office of the late J. Nota McGill to note the date of a reply to all letters in the upper left hand corner of the letters.

Q. 14. State whether or not you are familiar with the handwriting of the late J. Nota McGill?

A. I am.

(Mr. Church: The letter is offered in evidence as "Defendant's Exhibit No. 72, McBerty letter of April 20, 1914."

(Mr. Holmes: Introduction of this letter in evidence is objected to first, as the introduction of heresay testimony, secondly, as improperly proven. No basis has been made for proving this letter by secondary evidence and no opportunity given to plaintiff to cross-examine the writer of the letter on the contents thereof. The letter is immaterial, irrelevant and entirely improper and counsel for defendant is notified that a motion will be made in due course to strike the same from the record.

Q. 15. Please examine this second paper which I now show you and state if you know what it is and where it came from?

A. This is a letter from the National Electric Welder Company, dated February 1, 1913, addressed to J. Nota McGill and produced from the files of my firm, McGill & Maguire.

(Mr. Holmes: This question and answer are objected to for the reasons already stated in reference to the questions and answer as to the first letter introduced in evidence, and the objection is repeated to all further questions in reference to said letter.

Q. 16. How is this letter subscribed?

A. The National Elec. Welder Co., by Z. A. McBerty, Assistant Sec'y.

Q. 17. Who is Z. A. McBerty, if you know?

A. Z. A. McBerty is the wife of Mr. F. P. McBerty.

Q. 18. Are you familiar with the signature of Z. A. McBerty, who signed this letter as assistant secretary of the National Electric Welder Co., and if so state whether or not you recognize the written signature forming a part of this subscription as hers?

A. I am familiar with the signature of Z. A. McBerty and recognize that subscribed to the letter as her signature.

Q. 19. I notice on this letter at the upper left hand corner the notation "2/3/13." In whose handwriting is that and what does it indicate?

A. The notation is in the handwriting of the late J. Nota McGill and indicates the date of the reply to the letter upon which it appears, namely, February 3, 1913.

Q. 20. I believe you did not say what the notation "4/22/14" on Defendant's Exhibit No. 72 means. Will you please state what it means?

A. The numerals "4/22/14" on Defendant's Exhibit No. 72, indicate April 22, 1914.

Q. 21. The letter of February 1st, 1913, is offered in evidence as "Defendant's Exhibit No. 73, McBerty letter of February 1, 1913."

(Mr. Holmes: Plaintiff objects to the introduction of this letter in evidence for the reasons stated above in the objection to the first letter introduced in evidence at this hearing and notice is repeated that a motion will be made in due course to strike this letter from the evidence.)

Q. 22. Are we to understand that these two letters—Defendant's Exhibit No. 72 and Defendant's Exhibit No. 73—are produced by you from the files of the late J. Nota McGill which came into the possession of your firm as the successor to his business?

A. That is correct?

Q. 23. State whether or not you are able to say whether the notation "4/22/14" on the upper left hand corner of Defendant's Exhibit No. 72, and the notation "2/3/13" on the upper left hand corner of Defendant's Exhibit No. 73 were applied in due course of business and according to the common practice in the office of the late J. Nota McGill?

(Mr. Holmes: This question and the preceding question and all further questions with respect to these letters is objected to as immaterial and irrelevant, the letters not being properly in evidence.)

A. The notations "4/22/14" and "2/3/13," appearing upon the Exhibits Nos. 72 and 73 were applied in the due course of business and according to the common custom in the office of the late J. Nota McGill, no receiving stamp being used in the office to indicate the date of receipt, but the date of reply being always applied by pencil notation in the upper left hand corner.

Cross-examination by MR. HOLMES:

X-Q. 24. Have you in your office a file of Mr. McGill's correspondence including copies of letters which he himself wrote during the period of his practice?

A. We have nearly all of the files made up during the practice of the late J. Nota McGill, which include the letters addressed to Mr. McGill, and we have the letter books in which all letters written by Mr. McGill are letter pressed, with the possible exception of letters written in the earlier part of his practice and up to about 1895.

X-Q. 25. Will you please produce the letter press copy of the letter which Mr. McGill wrote to Mr. McBerty under date of April 22, 1914, in reply to the letter of April 20th, 1914, from Mr. McBerty, introduced in evidence as Defendant's Exhibit No. 72?

A. I have here our letter press book numbered 54 and wherein is a press copy of the letter from Mr. J. Nota McGill to the National Electric Welder Co., dated April 22, 1914.

It is stipulated that a copy of the letter may be read into the record from the letter book, the letter itself to be retained in the possession of Mr. Maguire.

The letter is as follows:

"22nd April, 1914.

The National Electric Welder Co.,
Warren, Ohio.

Dear Sirs:

I appreciate getting your letter of the 20th instant. There are many things which I do not understand as to the trial at Boston. Somebody got a case of weak knees or was it a case of cold feet? I cannot possibly understand the failure to lay foundation in the answer for your evidence. There is so much to consider that I prefer to defer saying anything more until I see Mr. McBerty, either here or in Warren.

I am today writing Mr. Edwards for information.

Very truly yours,

J. NOTA MCGILL.

M.I."

X-Q. 26. Will you please produce a copy of Mr. McGill's letter to Mr. Edwards and Mr. Edwards' reply thereto?

A. The copy of the letter from Mr. J. Nota McGill, dated April 22, 1914, to C. V. Edwards, Esq., is produced, being a press copy of the letter which is in our letter book No. 54, and Mr. Edwards' letter in reply, dated April 27, 1914, addressed to J. Nota McGill, Esq., is produced from our file.

The letter from Mr. McGill to Mr. Edwards follows.

"22nd April, 1914.

C. V. Edwards, Esq.,
No. 2 Rector Street,
New York.

Dear Mr. Edwards:

I hear that the testimony has been taken in open court in the suit on the Harmatta patent. What is the outlook? I also understand, in a general way, that McBerty's testimony was objected to for failure to lay foundation therefor in the answer. Is my understanding correct? I will appreciate any information you may give me.

Very truly yours,

J. NOTA MCGILL.

M.I."

Mr. Edwards' letter to Mr. McGill follows.

Francis S. Maguire.

"EDWARDS, SAEGER & WOOSTER

Counsellors at Law
United States Express Building
2 Rector Street, New York

Clifton V. Edwards

Lawrence K. Sager

Julian S. Wooster

(4175)

Telephone (4176) Rector

Cable Address

Edwayer New York.

April 27, 1914.

J. Nota McGill, Esq.,

McGill Building,

Washington, D. C.

Dear Sir:—

I have your letter of the 22nd. The taking of testimony in the suit on the Harmatta patent was completed and the case adjourned to be argued at a date to be fixed by the Court. This date has not been fixed. It is true that McBerty's testimony regarding earlier use was objected to and excluded upon the ground that such use was not set up in the answer. Mr. McBerty, however, gave very valuable testimony along other lines. It is, of course, impossible to form any accurate estimate of the outlook, but we have very strong hopes.

Yours very truly,

C. V. EDWARDS.

CVE.-G."

Indorsed on the upper left hand corner is the notation "4/30/14"

X-Q. 27. Will you please explain the notation "LB 50 page 911" on Defendant's Exhibit No. 73?

A. That has reference to letter book 50, page 911, wherein is pressed the reply to the letter of the National Electric Welder Co. of February 1, 1913.

X-Q. 28. Will you please produce a copy of that letter?

A. I produce letter book No. 50, where at page 911 is a letter from J. Nota McGill, dated February 3, 1913, to the National Electric Welder Co., reading as follows:

"3rd February, 1913.

The National Electric Welder Co.,
Warren, Ohio.

Dear Sirs:

I have your letter of the 1st instant and also the blade welded in 1901.

Mr. Fish advises me that he may be able to make an appointment for some day next week.

Very truly yours,

J. NOTA MCGILL."

X-Q. 29. I note on the letter press copy of this letter the notation in pencil "852." Will you please explain that notation?

A. The numerals in pencil "852" refer to the previous letter in letter book 50, addressed to The National Electric Welder Co., which is dated January 29, 1913.

X-Q. 30. The notation on each letter press copy of the page whereon is copied the previous letter written to the same person was the invariable practice in your office. Is that true?

A. That is correct.

X-Q. 31. Will you read into the record the letter of January 29, 1913?

A. The letter reads as follows:

"29th January, 1913.

The National Electric Welder Co.,
Warren, Ohio.

Dear Sirs:

I received your telegram yesterday, and in the next mail will doubtless have the Harmatta file.

I have asked Mr. Fish to designate some day next week when I may see him in New York.

Please send me one of the fan blades which was spot-welded in 1901 or thereabouts. I mean one of the two which Mr. McBerty showed me when last in Warren. Let him mark it in some way so that he can hereafter identify it when returned.

I am engaged in looking up the law on the question, and hope to report in a day or two.

Very truly yours,

J. NOTA MCGILL.

Later— I have your letter of the 28th instant and the Harmatta file wrapper.

I suggest that Mr. McBerty go to Cincinnati but pay his own expenses. Listen to what they have to say, but state that without consulting the other officers of the Company he is in no position to commit the National. After he learns what action is to be taken by the different parties he will confer with his associates and then advise them in the premises. Until his associates know what the others intend to do, and how they intend to take care of the National in the proposed deal, he is in no position to disclose the evidence upon which he may rely should suit be brought against us.

JNM

X-Q. 32. Will you please show me the letter from The National Electric Welder Co., under date of "the 28th instant" referred to by Mr. McGill in the letter of January 29, 1913?

A. I hand you the letter of January 28, 1913, from The National Electric Welder Co. to J. Nota McGill, reading as follows:

"Warren, Ohio January 28th,
1913,

J. Nota McGill,
Attorney At Law,
Washington, D. C.
Dear Sir:—

Your favor of the 27th inst., at hand, and are pleased to note Mr. Fish is sufficiently interested in your evidence to suggest a meeting. If possible we will be pleased to have you take the matter up with him Thursday.

We are forwarding by registered mail today, the file wrappers of the "Harmatta" case, but beg to advise this is a copy supplied us by the Winfield Co. Mr. Warren of The Toledo Elec. Welder Co., sent his copy to the Winfield Co., suggesting they make a copy for themselves and the National Co., which they did, but we would not want to guarantee the same as being a duplicate of the original.

We are enclosing herewith copy of a letter received from Mr. Warren, and are pleased to note that this company are deeply interested in preventing the National Co., from doing anything which might cause us future anguish.

Thanking you for past favors, and hoping the matter under consideration can be arranged to the satisfaction of all parties concerned, we are

Very respectfully yours,
THE NATIONAL ELEC. WELDER CO.
per

F. P. MCBERTY,
Sec'y and Treas.

FPM/ZM.

P. S. Your advise regarding the advertising the situation between the Thomson Co., and ourselves will be heeded, and will let the matter rest as it is for the time being."

X-Q. 33. Please produce the letter received from Mr. Warren referred to in the letter of January 28, 1913, as enclosed therewith?

A. The copy of the letter referred to in the letter of The National Electric Welder Co. of January 28, 1913, is produced, and reads as follows:

"COPY.
THE TOLEDO ELECTRIC WELDER CO.
Cincinnati, Ohio.
Jan. 25-1913.

Mr. F. P. McBerty,
c/o National Electric Welder Co.
Warren, Ohio.

Dear Sir:—

Yours of the 24th at hand, and the matters we want to talk over with you can be discussed at a personal interview better than in any other way. If you will come to Cincinnati, we will be very glad to pay your expenses, and would ask that

you arrange to come at as early a date as possible, as we believe it of sufficient importance to go over the matter we have in mind, to drop everything else at the present time, to get together. If you will accede to our proposal to come here we will explain the proposed deal, and it is not our intention to have you left out as long as we originally started in to work together. There was a disposition on the part of some parties to ignore the National Co. but this we would not allow. We were invited to attend a conference in Cleveland, and expected to see you there, but found that you were not expected.

We trust that you will accept our suggestion and come here at the earliest possible moment, as we believe a definite decision will be reached within the next week as to what action will be taken by the different interests, and we believe it of more importance to you than ourselves to have a meeting very quickly.

Yours respectfully,
(Signed) F. W. WARREN."

X-Q. 34. After the death of Mr. McGill, did the firm of McGill & McGuire continue as attorneys for the National Electric Welder Co. or Mr. McBerty?

A. The firm of McGill & Maguire has represented The National Electric Welder Co. and Mr. McBerty.

X-Q. 35. Has that representation continued to the present time?

A. Yes.

X-Q. 36. Have you in your files any correspondence between Mr. J. Nota McGill and The Toledo Electric Welder Co., or any officer thereof?

A. That I could not say without an examination of our files.

X-Q. 37. Will you please examine your files during the year 1910 and state whether or not there was any such correspondence?

(Mr. Church: Counsel for defendant objects to this line of examination as not proper cross-examination. The cross-examination of this witness has already gone far afield. In respect of other matters than those upon which the direct examination of the witness was predicated plaintiff is entitled to call the witness as its own witness. Having, however, no purpose to restrict the cross-examination beyond reasonable limits, counsel for defendant asks counsel for plaintiff his purpose in asking the last question put.)

(Mr. Holmes: Counsel for defendant in the hearing at Detroit and at this hearing has introduced in evidence letters and copies of letters to and from Mr. McGill, having an alleged bearing on an alleged use of the process of the patent in suit by Mr. McBerty in the year 1901 and also as having an alleged bearing on the question of the conduct of a suit by the Thom-

son Electric Welding Company against Barney & Berry. Counsel for defendant has thereby opened up the files of Mr. McGill and used such letters as he desired to produce having alleged bearing on these matters and it is manifestly improper for defendant to use part of this file without producing the whole file.)

(Q. 37 is repeated.)

(Mr. Church: Counsel for defendant replies that this witness was produced for the purpose of identifying and proving two letters from The National Electric Welder Company to the late J. Nota McGill, Esq., and the proposed continuation of his cross-examination is deemed to be, under Federal Practice, entirely incompetent, irrelevant and immaterial and not proper cross-examination, and the witness is advised that he may not make answer to the last cross-question proposed, unless directed to do so by order of court.)

A. I decline to answer the last question unless directed so to do by a court of competent jurisdiction.

X-Q. 38. Have you in the files of your office any correspondence between the late J. Nota McGill or the firm which succeeded him, and the Toledo Electric Welder Co., or any officer thereof which has reference to or mentions a certain claim of one F. P. McBerty to have used the process of spot welding in the years 1901-2 or 3 at Warren, Ohio, or which has reference to or mentions any fan blades alleged to have been spot welded by Mr. McBerty, as aforesaid, or which mentions or has reference to the defense by the Toledo Electric Welder Co., of a suit brought by the Thomson Electric Welder Company, in which the Toledo Electric Welder Co. was interested. I limit my question to correspondence beginning in the year 1910.

(Mr. Church: Question objected to as incompetent, irrelevant and immaterial and not proper cross-examination and the former suggestion to the witness is repeated.)

A. I decline to answer the foregoing question except under authority of a court of competent jurisdiction.

X-Q. 39. Will you please produce such correspondence between J. Nota McGill and the Toledo Electric Welder Co. as may refer to or mention each or any of the matters outlined in X-Q. 38?

(Mr. Church: Last objection repeated.)

A. The answer to the preceding question is repeated as answer to this.

X-Q. 40. Were all letters written by the late J. Nota McGill to Mr. McBerty addressed to The National Electric Welder Co.?

A. I cannot answer definitely as to this because there may have been some letters directed to Mr. McBerty personally.

X-Q. 41. Will you please determine from your files whether there are copies of any letters addressed to Mr. McBerty personally, commencing the year 1910?

A. I shall be very glad to do so.

X-Q. 42. Have you examined the file of Mr. McGill's correspondence commencing the year 1910 to determine whether or not there are any such letters?

(Mr. Church: Same objection.)

A. I have not done so.

X-Q. 43. Will you please do so?

(Mr. Church: Same objection.)

A. That will require a considerable amount of time.

X-Q. 44. I asked you if you would so so?

(Mr. Church: The objection is repeated and the witness is instructed that he need not make the examination suggested without an order of court directing him to do so.)

A. If directed by an order of a court of competent jurisdiction I will make the examination.

X-Q. 45. Do you decline to do so unless so ordered?

A. I do.

X-Q. 46. Will you kindly produce any copies of letters which there may be in the files of your firm from Mr. McGill to Mr. McBerty, having reference to or mentioning an alleged use by Mr. McBerty of the process of spot welding at Warren, Ohio?

(Mr. Church: Same objection and direction.)

A. I will not produce any such letters except under authority of court.

X-Q. 47. Will you produce any letters or copies thereof which may be in your files from the late Mr. McGill to Mr. McBerty, having reference to or mentioning any fan blades alleged to have been spot welded by Mr. McBerty, at Warren, Ohio, or mentioning or having reference to the conduct by the Toledo Electric Welder Co. of a suit brought by the Thomson Electric Welding Co., in the defense of which the Toledo Co. was interested? I ask you to produce letters or copies thereof having relation to or mentioning either or both of these matters?

(Mr. Church: Same objection and direction.)

A. Same answer as to the preceding question.

X-Q. 48. The letter of January 29, 1913, quoted in the record, in answer to X-Q. 31, has the notation at the top "817." Will you

please produce the letter at page 817 which according to your testimony this notation refers to?

A. I produce letter book No. 50, where at page 817 there is a letter dated January 27th, 1913, addressed to The National Electric Welder Co., which reads as follows:

"27th January, 1913.

The National Electric Welder Co.,
Warren, Ohio.

Dear Sirs:

I enclose herewith a copy of a letter I have just received from Mr. Fish, the Thomson Company's attorney, and a copy of my reply. Do you want me to go to New York to confer with Mr. Fish?

I have your letter of the 24th instant. At this stage of the matter do not advertise your attitude in respect to the Thomson Company. I think the subject of bond should remain in abeyance until after Mr. Fish and I conclude negotiations. What I want is to get you out of this trouble or to secure some terms for you without including either of the other companies. Evidently they are carrying on negotiations independently of you, and naturally are looking out for their own ends. When they feel the helplessness of their situation they recall your existence.

If the Thomson people decline to deal with us, we can then arrange with a surety company for bond and also determine on the advertising policy.

I note that William Smith, now of Charleston, West Virginia, recalls the use of the spot welder. If necessary, I will prepare an affidavit for him to execute.

Yes, I would like to see the Harmatta file *at once* before I either see or communicate with Mr. Fish.

Very truly yours,

J. NOTA MCGILL.

Enclosure."

X-Q. 49. Will you please produce the letter from National Electric Welder Co. to Mr. McGill, of January 24, 1913, referred to in this letter of January 27th?

A. I produce a letter from The National Electric Welder Company, dated January 24, 1913, to J. Nota McGill, which reads as follows:

"Warren, Ohio, January 24th,
1913.

J. Nota McGill,
Attorney At Law,
Washington, D. C.
Dear Sir:—

We have been requested by a number of firms, among others The General Fireproofing Co., in Youngstown, O., to

give them a bond to protect them against incurred expense of litigation, due to the threats made by The Thomson Co. The writer had some conversation with Mr. White of the above mentioned company, who suggested that if I was in a position to put up a good fight with the Thomson Co., on this spot welding proposition, it might be policy to advertise the fact.

I am therefore writing to ask whether you could take up this matter of patent situation, and our ability to prove a good case with a representative of some good bonding company. For instance, The American Surety Co., and go over with their attorney the situation in detail, and if they consider our chances as good we have no doubt but they would bond us for a reasonable price of a machine, we would then advertise the fact that we would sell our machines with a guaranteed bond with some surety company. This would result in attracting considerable attention to the NATIONAL" welders, and enable us to secure a line of business which would not be in competition with the Toledo and Winfield Co's, due to the fact that they would not dare to advertise in such a manner themselves, and it would also bring to a head the patent situation between the Thomson and National Co's, promptly.

As I look at the situation, the Thomson Co., may consider the National Co., as being very small, not spending much money pushing the business, and for this reason think it policy to ignore us entirely and continue their intimidation in advertising, with the result they would check the efforts of the Toledo and Winfield Co's., and unless we started something ourselves we would never get to a final show down at all.

I will be pleased to have you express your opinion on this subject at your earliest convenience, and also advise us whether you consider it policy to give a bond covering the sale price of a machine.

In connection with our evidence we have been securing, I have located another witness to the building and demonstrating of the old welder, in the person of William Smith formerly of this city, who is now superintendent of some firm in Charleston W. Va. I was talking with him this A.M. and he remembers very well the use of the machine as a spot, butt welder, also as a welding machine for welding wire, such as is covered by the "Clinton" patents. Mr. Smith was employed by The Warren Elec. and Specialty Co., in 1899, 1900 and he has been with The Peerless Elec. Co., until about one year ago. He is a man of un-questionable integrity, is exceedingly well liked and well known in this city, and further more has a wide range of electrical knowledge. He can identify the changes that have been made on the old machine, remembers how it was originally built, and did considerable work on the machine himself. He was very much interested in the welder as it was the first machine of the type he ever saw. If you

Francis S. Maguire.

think it policy, and will outline the statement, Mr. Smith will be glad to supply all the information he possibly can, the same as Powers, Lipps and Brown.

We were in receipt of a letter from Mr. Warren, of The Toledo Elec. Welder Co., as per enclosed copy. We are also enclosing herewith copy of our reply. The writer thinks it policy to keep on friendly terms with The Toledo Co.

Hoping to have the pleasure of hearing from you at an early date regarding the matters mentioned, we are

Very respectfully yours,

THE NATIONAL ELEC. WELDER CO.

per

F. P. McBERTY,

Sec'y and Treas.

EPM/ZM

P.S. We have just been in receipt of the copies of file wrappers of the Harmatta case, from The Winfield Co. These were sent by Mr. Warren. Would you care to have copies?

X-Q. 50. Will you please produce the copy of the letter from Mr. Warren and the copy of the reply from Mr. McBerty referred to in the letter of January 24, 1913, just read into the evidence?

A. I produce copy of letter dated January 23, 1913, from Warren to National Electric Welder Co. and a copy of a letter dated January 24, 1913, addressed to The Toledo Electric Welder Co., attention Mr. F. W. Warren, from The National Elec. Welder Co. These letters read as follows:

"COPY.

THE TOLEDO ELECTRIC WELDER CO.

Cincinnati, Ohio.

Jan. 23-1913.

National Electric Welder Co.

Warren, Ohio.

Gentlemen:

We wrote you a short time ago regarding an interview that was to be held with representatives of the Thomson and Universal Co. The appointment was made by the Winfield Co. and Mr. Macneale and the writer went to Cleveland to attend the meeting. A proposition was put up to us, but we told them very plainly that your company would have to be included in any arrangement that was made.

Mr. Lachman went back East, but is going to return in a week or ten days and we believe it of the utmost importance that Mr. McBerty meets us before that time. We cannot very well enter into details of the proposition by correspondence, and would ask if he can come here to talk over the matter, as we firmly believe it is to his interest to do so. We would

like to have a meeting at the earliset possible moment, and if Mr. McBerty is not at home, will you kindly let us know where he can be reached by wire or letter so that we can make an appointment with him?

Very respectfully yours,

THE TOLEDO ELECTRIC WELDER CO.

(Signed) FRANK WARREN."

"Copy.

"January 24th,
1913.

The Toledo Electric Welder Co.,
Cincinnati, O.

Attention Mr. F. W. Warren.

Gentlemen:—

Re. yours January 23rd, 1913.

We have noted that you were present at a meeting held by representatives of the Universal and Winfield Co's, and the writer is surprised that Mr. Winfield did not notify the writer. In line with this same information beg to advise we have not heard a word from Winfield since the meeting at The Park Hotel, some time since.

There is no doubt but the Winfield Co., are doing all they can to eliminate the National Co., from this arrangement and under the circumstances it is entirely satisfactory.

The writer has been out of the city most of the time since you were here and am leaving again today for a few days, but expect to return within three or four days, will advise definite date of meeting when I return, if possible.

I note that Lackman is the man you are apparently dealing with, and am wondering why you are not dealing directly with the Thomson Co., as I understand Lackman is absolutely independent of the Thomson Co., other than his connection in a business way through the sale of the machines. It would seem to the writer that the Thomson Co., would be the ones to deal with.

Lackman's only interest is in lining up the independent manufacturers so as to get a good proposition to lay before the Thomson Co., which will enable them to hold the Thomson Co., to their present arrangement, which is apparently satisfactory to the Universal Co. Any arrangements made with Lackman will finally have to be sanctioned by the Thomson Co., and inasumch as the Universal Co., have no controlling vote or further interests in this other company, the writer cannot see how any agreement that is made can amount to anything more than merely putting the Universal Co., in a better position to deal with the Thomson Co.

Kindly let me hear an expression of your opinion regarding the subject mentioned.

We are pleased to advise that the Winfield Elec. Welding Machine Co., sent us a copy of the file wrappers of the Har-matt case.

Hoping to have the pleasure of seeing you within a short period, we are

Very respectfully yours,
THE NATIONAL ELEC. WELDER CO.
per

FPM/ZM

Sec'y and Treas."

X-Q. 51. In order to save time will you kindly produce for my inspection the complete file of correspondence between the late Mr. McGill and The National Electric Welder Co., commencing the year 1910?

(Mr. Church: Objected to as incompetent, irrelevant and immaterial, and not proper cross-examination and the witness is directed not to answer unless required by an order of court.)

A. I decline to do so unless by order of court.

X-Q. 52. Will you please produce a complete file of the correspondence between The National Electric Welder Co. and the late Mr. McGill having any reference to the matter of any alleged spot welding alleged to have been done by Mr. McBerty at Warren, Ohio, in the year 1901, or having any reference to the case brought by the Thomson Electric Welding Company against Barney & Berry, in which the Toledo Electric Welder Co. was interested or having any reference to certain fan blades alleged to have been spot welded by Mr. McBerty at Warren, Ohio, in 1901?

(Mr. Church: Same objection and instructions.)

A. Same answer as to previous question.

X-Q. 53. Do you decline to produce any further correspondence between the late Mr. McGill and The National Electric Welder Co. relating to any of these matters.

(Mr. Church: Same objection and instructions.)

A. I do.

X-Q. 54. Please produce any correspondence which may have been had between the firm of McGill & Maguire and The National Electric Welder Co. having any reference to any of the matters referred to in X-Q. 52?

(Mr. Church: Same objection and instructions.)

A. I must decline to do so unless ordered so to do by a court order.

X-Q. 55. Will you produce the correspondence in your files between the late Mr. McGill and the firm of Edwards, Sager & Wooster, or Mr. Edwards, of that firm, or Mr. Thomas Howe, having any reference to the matters mentioned in X-Q. 52?

A. I must decline to do so, unless authorized by court order.

X-Q. 56. Will you please produce the copy of the letter referred to by the notation "659" on the copy of the letter of January 27, 1913?

A. The letter on page 659, Letter Book 50, is produced, and reads as follows:

"11th January, 1913.

The National Electric Welder Co.,
Warren, Ohio.

Dear Sirs:

I have your letter of the 9th instant enclosing second affidavit of Mr. Frank G. Brown. I have not yet heard from the Thomson Electric Welding Co., but this is not surprising.

At present I expect to be in Columbus on Thursday instead of Wednesday of next week, and if Mr. McBerty will be at Warren on Friday, I will go there from Columbus, but not unless I am first advised that he will be in Warren.

Very truly yours,

J. NOTA MCGILL."

X-Q. 57. Will you please produce the letter of January 9th to Mr. McBerty, referred to in this letter of January 11th? Witness will please produce letters without reading them unless requested by counsel.

A. I produce letter of January 9, 1913, from The National Electric Welder Co. to J. Nota McGill, which reads as follows:

"Warren, Ohio, January 9th,
1913.

J. Nota McGill,
Washington, D. C.

Dear Sir:—

We are enclosing herewith revised statement from Frank G. Brown, Detroit, Mich. Our Mr. F. P. McBerty is in Detroit at the present time, having been there several days getting his evidence into shape.

He wishes us to advise you that on talking with Mr. Brown, he finds that his first statement was not quite correct, as he had confused the welder with a platinum cutting and welding machine which was built for the Warren Electric & Specialty Company.

Mr. McBerty will be in Warren either Saturday morning or Sunday morning, and will proceed to have photographs taken of the small welder, and no doubt, he will be ready for you by Tuesday or Wednesday of next week.

Francis S. Maguire.

We will wire you just when we think it advisable for you to come to Warren.

Thanking you for past favors, we are

Very respectfully yours,

THE NATIONAL ELEC. WELDER CO.
per

ZAM/LS

Assistant Sec'y."

X-Q. 58. Will you please produce the letter referred to by the notation "612" on the letter press copy of the letter of January 11th, 1913?

A. The letter appearing on page 612 of Letter Book No. 50 is as follows:

"8th January, 1913.

The National Electric Welder Co.,
Warren, Ohio.

Dear Sirs:

I have your favor of the 6th instant enclosing statement of Mr. J. W. Powers. I may be in Columbus on Wednesday next, the 15th instant, and if so I shall spend the next day in Warren.

Very truly yours,

J. NOTA MCGILL."

X-Q. 59. Will you kindly produce the letter of January 6th referred to in this letter?

A. The letter of January 6th referred to in the letter from J. Nota McGill to The National Electric Welder Co., of January 8th, 1913, reads as follows:

"Warren, Ohio, January 6th,
1912.

J. Nota McGill,
Washington, D. C.

Dear Sir:—

Your favor of the 4th inst., received.

Mr. McBerty is in Detroit, Mich., and the writer has forwarded your letter to him. Mr. McBerty will no doubt advise you from Detroit just when he thinks advisable for you to come to Warren.

We are enclosing herewith statement taken from Mr. J. W. Powers. This statement was taken here at the office Sunday the 5th inst., dated the 4th, and Mr. Powers took the original statement back with him to Findlay and will have the same sworn to before a NOTARY PUBLIC, today.

Very respectfully yours,

THE NATIONAL ELEC. WELDER CO.
per

Z. A. MCBERTY,
Assistant Sec'y and Treas.

ZAM"

X-Q. 60. Have you the statement taken from Mr. J. W. Powers referred to as enclosed in this letter?

A. No, I have not.

X-Q. 61. Will you produce Mr. McGill's letter of January 4th, 1913, referred to in the last letter just produced?

A. The letter referred to is on page 567 of Letter Book No. 50 and reads as follows:

"4th January, 1913.

The National Electric Welder Co.
Warren, Ohio.

Dear Sirs:

Re: Thomson Electric Welding Co.

I note all that you say in your favor of the 2nd instant. Please let me have a photograph or several of them taken at different angles of the spot welding machine which was constructed in 1901. To be of value as evidence of prior use it must not appear that this was a mere abandoned experiment, but it must be shown that the machine was used for spot welding. If the evidence is not sufficient to substantiate our allegation of prior use, it may be sufficient to substantiate our allegation of prior knowledge.

I have written the Thomson (not Thompson) Electric Welding Company, and enclose herewith a copy of my letter. I ought to see the machine you have in your custody before it is submitted to the attorney for the Thomson people. I entertain no doubt that I shall soon hear from their attorney and that he will want to see the machine. Before showing it to him I want to understand it more clearly. The affidavits submitted are not wholly sufficient, but I do not want to suggest any change until after I see the machine. I take it that you have not involved yourselves with other manufacturers of spot welding machines and that, so far as this matter is concerned, you want to protect yourselves. If the Thomson people will grant you a license, you can afford to surrender your evidence. If they will not grant you a license, you might arrange then with the Toledo people that in consideration of placing in their hands the evidence you possess they are to pay three-fourths of the expense of any litigation that may be brought either against you or themselves. My idea is to ignore the Winfield Company.

I am inclined to think it is policy to hunt for business and promise your customers that you will take care of them. I cannot say more than this until I see the machine. I do not like to put you to the expense of my going to Warren solely for that purpose, but I think it would be advisable to have me make the trip even though nothing else calls me in that direction. The matter can stand for the time being if Thom-

son's attorney does not promptly take up the subject, but once he communicates with me then I will have to arrange to see the machine before showing it to him.

Very truly yours,

J. NOTA MCGILL.

Enclosure"

X-Q. 62. Will you turn to Letter Press Book No. 54 and produce the letter shown therein from Mr. McGill to The National Electric Welder Co. next after that of April 22, 1914, which you read in the evidence in answer to X-Q. 25?

A. On reference to that letter I find that it pertains to the payment of a final Government fee on an application for patent.

X-Q. 63. Will you kindly show me the copy of the letter from Mr. McGill to the National Electric Welder Co. next after April 22, 1914, having any reference to the case of Thomson Electric Welding Co. vs. Barney & Berry, or to any alleged spot welding done by Mr. McBerty at Warren, Ohio, in 1901?

A. The next letter in Letter Book 54, following that of April 22, 1914, having any bearing on the matters referred to in the question is one appearing at page 555 and which reads as follows:

"30th April, 1914.

The National Electric Welder Co.,
Warren, Ohio.

Dear Sirs:

Upon my return this morning I find your letter of the 24th instant and also one from Mr. Edwards. He tells nothing of importance, and fails to explain why he did not amend his answer to lay foundation for your testimony as to priority.

Very truly yours,

J. NOTA MCGILL.

M.I."

X-Q. 64. Will you please produce the letter under date of January 2nd, 1913, referred to in the letter of January 4th, 1913, which you produced in answer to X-Q. 61?

A. The letter referred to reads as follows:

"Warren, Ohio, Jan. 2nd,
1912.

J. Nota McGill,
Washington, D. C.

Dear Sir:—

We are enclosing herewith copy of notification regarding the patent situation, from the Thompson Co. We are also sending statements made by Mr. F. G. Brown, Detroit, Mich. and Mr. E. C. Lipps, Detroit, Mich. These gentlemen are old shop mates of the writers, and men with excellent mechanical ability.

I am leaving tonight for Detroit and will take up with Mr. Brown the matter of the date on his statement covering the time of the electric welder, as you will note his date is 1900, while Mr. Lipps date is 1901. This is apparently a mistake made by the stenographer in making it 1900 instead of 1901.

As I advised you before I have with me here at the factory the old welder which was originally designed for a butt welder, but on which we did the spot welding, together with the transformer which was used in connection with the machine. We also have the original factory records which shows the date on which this transformer was designed, and would further say the transformer was designed and built for a pneumatic wheel company in New Jersey to enable them to find out what voltage was necessary to give the proper results in welding, and was sent out for that purpose. After the company had used it they returned it to The Warren Elec. and Specialty Co., and they then built them a larger welding transformer for their machine.

The small welding transformer which was returned to The Warren Elec. and Specialty Co., was then turned over to the fan motor dep't and was used in connection with this electric welding machine. The date of the manufacture of this transformer was June, 1900, and the transformer was returned to The Warren Elec. and Specialty Co., in the fall of the same year. The same was turned over to the fan motor dep't Jan. 25th 1901.

Mr. McCurdy, who has been with the Warren Elec. and Spec. Co., and The Peerless Elec. Co. for years, also my partner in the Enterprise Elec. Co., this city, can identify these dates.

I am now going out to get our shop superintendents statement regarding the building and demonstrating of the butt and spot welder which was done on this machine in 1901. This gentleman is Superintendent of The Buckeye Traction Ditcher Co., in Findlay, O., at the present time, and after that I have one more statement to secure from one of the men now employed by The Peerless Elec. Co., this city. These latter statements I will forward just as soon as I get them lined up, and will get them up in better shape if you think necessary. I have sent you copies only of the statements. I have the originals which are signed up by a Notary Public. If you can suggest anything to make these more water tight, kindly do so at your early convenience.

I have also samples of spot welding which was done on the welder at the time we did this experimenting, and while we are unable to identify the exact date, we can approximate it within two or three months.

There is one more thing about which I wish to advise you and that is: The idea of developing the butt welding machine was to enable us to manufacture a cheaper grade of fan than

the ones we were making at that time, and all fan motors of that desk fan type, had at that time brass blades and blade holders, or centers. Our idea was to make a steel blade and a steel center, and when we did that we proved out this electric spot welding process. These blades were to be painted or japanned black, and the guards were to be tin coated.

The company however were still manufacturing the high grade fans, which necessitated brass blades and brass centers, and while we punched the blades with the same dies, it would have been necessary to have one set of dies arranged to punch the holes for rivets in the brass blades and another set of dies to punch holes for rivets in the blades and another set of dies without punches to make holes for rivets for the steel blades. This was considered at the time as being an objection as it necessitated added equipment which would not be necessary if we riveted all the blades, both brass and steel. We, however brass plated the steel blades after that time and found it took a very good finish, but Mr. Gillmer did not advocate the use of the spot welding of the steel blades, as we had already manufactured our punches, dies and had brass rivets in stock.

I feel that we have a particularly good case, and I want you to frankly criticise, and put it up to us in any way possible where we are liable to "stub our toes" on this, and when we finally get our evidence lined up, we want you to handle this deal with the Thompson Co., if you think we are in a position to offer to deal with them.

We have also heard from the "Toledo" Elec. Welder Co., and The "Windfield" Co., both of whom are very anxious to find out what I have in the way of information that can be used to advantage to them if they were able to get ahold of it and put up a fight against the "Thompson" Co.

The "Toledo" company are organized for \$75,000.00 all paid in and good for this amount, but the "Winfield" company are not considered as being a good financial proposition at all.

Kindly advise what steps we are to take regarding the "Thompson" Co., and whether it is policy to hunt for business and promise our customers that we will be in a position to take care of them in case suit is entered against them or ourselves.

We would suggest that you secure a copy of the January 1913, issue of "Machinery" and look on page 182, you will see what the "Thompson" company have to say regarding the patent issued them recently.

In connection with the patent situation, Mr. Warren of the "Toledo" Co., has spent considerable money securing information regarding the various moves which have been made in securing the "Harmatta" patent, and he promised to forward the same to us, which would enable us to get copies.

Under the circumstances I told him we would be interested in securing this information, and when the same is forwarded to us we will be pleased to furnish you copies if you so desire.

Hoping we can get the matter straightened out in the near future, I am,

Very respectfully yours,
F. P. MCBERTY,
Sec'y and Treas.
The National Elec. Welder Co.

The matter appearing in the 9th paragraph of this letter is confused and is corrected by letter of The National Electric Welder Co., dated February 10th, 1913, which reads as follows:

"Warren, Ohio. Feb'y 10th,
1913.

J. Nota McGill,
Attorney At Law,
Washington, D. C.

Dear Sir:— Re. yours Feb'y 7th, 1913.

We are enclosing herewith copy of paragraph as it should have read in our letter to you January 2nd, 1912.

"The company however were still manufacturing the high grade fans which necessitated brass blades and brass centers, and while we punched the blades with the same dies, it would have been necessary to have one set of dies arranged to punch holes for rivets in the brass blades and another set of dies without punches to make holes for rivets for the steel blades. This was considered at the time as being an objection, as it necessitated added equipment which would not be necessary if we riveted all the blades, both brass and steel. We however brass plated the steel blades after that time and found it took a very good finish, but Mr. Gillmer did not advocate the use of the spot welding of the steel blades, as we had already manufactured our punches dies and had brass rivets in stock."

Regretting this typographical error we are,

Very respectfully yours,
THE NATIONAL ELEC. WELDER CO.

per

F. P. MCBERTY,
Sec'y and Treas."

FPM/ZM

X-Q. 65. Will you please state what the notations are, in pencil, on page 2 of the letter of January 2nd, from Mr. McBERTY just copied?

A. The first notation is an insertion of the name "J. W. Powers," after the word "gentleman" in line 4, the name being in the handwriting of the late J. Nota McGill. The second notation also in the handwriting of J. Nota McGill is the name "Robt. Bean"

inserted after the word "employed" in the 6th line of page 2. The paragraph in which these notations are made begins "I am now going out."

X-Q. 66. Will you please produce Mr. McGill's letter of February 7th, 1913, referred to in McBerty's letter of February 10th, 1913?

A. The letter of February 7th, 1913, referred to in the question appears at page 966 of Letter Book No. 50, and reads as follows:

"7th February, 1913.

The National Electric Welder Co.,

Warren, Ohio.

Dear Sirs:

Please refer to your letter to me dated January 2, 1912. In the fourth paragraph page 2, lines 5 and 6, is there not some confusion? This reads:

"* * * for rivets in the brass blades and another set of dies to punch holes for rivets in the blades and another set of dies without punches to make holes for rivets for the steel blades."

I wish you would throw a little light on this subject, and let me hear from you by early mail.

I have an engagement with Mr. Fish for Thursday of next week in New York.

Please look over the enclosed statement which I have prepared to hand Mr. Fish. Correct it wherever necessary. Please return it by early mail.

Very truly yours,

J. NOTA MCGILL.

Enclosure"

X-Q. 67. Have you the statement prepared for Mr. Fish referred to in this letter?

A. I have not.

X-Q. 68. Noted on the letter of February 10, 1913, to Mr. McBerty, in pencil, are the figures "2/11/13." Will you kindly produce the letter of that date evidently referred to by this notation?

A. The letter referred to by the pencil notation appears in Letter Book 51 at page 4, and reads as follows:

"11th February, 1913.

The National Electric Welder Co.,

Warren, Ohio.

Dear Sirs:

I have your letter of the 10th instant correcting the statement in your letter of January 2nd. I now understand that it was the purpose to make both the brass and steel blades with the same dies, but if the steel blades were spot-welded, holes would not be punched in them, hence they could not be made with the dies used for punching the brass blades since the lat-

ter had to have the holes made therein at the time of their formation.

I shall advise you as to the result of my conference with Mr. Fish.

Very truly yours,
J. NOTA MCGILL."

X-Q. 69. Referring to the letter of January 4th, 1913, on page 567 of Letter Book No. 50, will you please produce copy of the letter next preceding that from Mr. McGill to the National Electric Welder Co.

A. The letter relates to an interference and is in no sense in reference to this matter.

X-Q. 70. Will you please produce the next preceding letter?

A. The next preceding letter appears at page 375 of Letter Book 50 and reads as follows:

"13th December, 1912.

The National Electric Welder Co.,
Warren, Ohio.

Dear Sirs:

Taylor vs. Warren.

I have received the concession of priority signed by Warren, but I have returned it for the corporate seal.

In thinking over the Harmatta patent, it occurs to me that it might be to your interests not to enter into any alliance with other manufacturers having for its object the making of terms with Thomson Co. If your evidence is, as it now appears to be, sufficient to invalidate the Harmatta patent, the Thomson people would doubtless be willing to negotiate with you on satisfactory terms, provided they were not compelled to similarly deal with your competitors. If there is any reason for giving the latter the benefit of the defense you have, then, of course, they will continue to be competitors. I suggest these things for your consideration.

Very truly yours,
J. NOTA MCGILL."

X-Q. 71. Referring to the letter of January 2, 1913, from Mr. McBerty to Mr. McGill, produced by you in answer to X-Q. 64, will you kindly produce the next preceding letter in order of time from Mr. McBerty to Mr. McGill having any reference to the alleged spot welder by Mr. McBerty, at the Warren Company?

A. The next letter preceding that of January 2, 1913, from Mr. McBerty to Mr. McGill, relating to the spot welder matter, appears to be one dated December 9, 1912, which reads as follows:

"Warren, Ohio. December 9th,
1912.

J. Nota McGill.
Attorney At Law
Washington, D. C.
Dear Sir:—

We are returning herewith license signed up as per your request.

The writer has before him copy of the patent granted to the Thompson Co., but regret that I have not had an opportunity to look over the same carefully, as I just returned from a somewhat lengthy trip.

I expect to meet all parties interested in the manufacture of electric welding machines, excepting the Thompson Co., in Toledo, O. Wednesday of this week, and after that date I will be in a position to state definitely just what they expect to do, or think they can do regarding this patent situation.

In connection with this subject, I am interested in knowing whether if I manufactured a machine and did spot welding on it, before the application was made in England or the United States in a satisfactory; and practical manner, would this have bearing on the granting of the patent at the present date to the Thompson Co?

I have been looking up my witnesses and etc. on this matter and if we have any chance at all I am confident that we can either put up an extraordinary good fight, or be in a position to ask the Thompson Co., for a satisfactory settlement.

I will write you full details regarding the situation after my return from Toledo, Wednesday.

Thanking you for past courtesies, we are,

Very respectfully yours,
THE NATIONAL ELEC. WELDER CO.
per

F. P. MCBERTY.
Sec'y and Treas.

FPM/ZM"

X-Q. 72. Will you kindly search the file again and tell me if there is any letter between December 9th, 1912 and January 2nd, 1913, from Mr. McBerty to Mr. McGill, having reference to this same subject matter?

I have searched the file and fail to find any such letter.

X-Q. 73. You fail to find any letter between those dates from Mr. McBerty to Mr. McGill having any reference to the subject of spot welding.

A. That is correct.

X-Q. 74. Will you please produce the letter from Mr. McGill to Mr. McBerty under date of December 10, 1912?

A. The letter referred to in the question appears in Letter Book 50 at page 351 and reads as follows:

"10th December, 1912.

The National Electric Co.,
Warren, Ohio.

Dear Sirs:

I have your favor of the 9th instant enclosing the license, which I have forwarded to the Toledo Electric Welder Co.

Yes, broadly speaking, if you constructed and operated a spot welding machine before Harmatta's first filed foreign application, and he is unable to show that the invention has been communicated by him to others in this country prior to the construction and operation of your machine, such machine will constitute an anticipation of Harmatta, provided it was not an abandoned experiment. In other words, if the machine was constructed and used in an experimental way and then abandoned, it will not be available as a defense. If, on the other hand, it was long in use, and was used where it could be seen by people connected with the establishment, it would constitute a good defense.

I note with satisfaction that you have been looking up your witnesses. Have you also looked up the machine? In other words, is it still in use?

I suggest that you be very careful in dealing with the Thomson Company. Take the matter up with me before dealing with them.

Very truly yours,

J. NOTA MCGILL."

X-Q. 75. Will you please produce the letter next succeeding the letter of December 10th, 1912, from Mr. McGill to Mr. McBerty, having reference to spot welding?

A. There is no letter between these dates relating to this subject, except the letter of December 13, 1912, which is already in the record.

X-Q. 76. Will you please produce the letter next preceding that of December 10, 1912, from Mr. McGill to Mr. McBerty, having reference to the matter of spot welding?

A. The letter next preceding that of December 10, 1912, appears at page 308 of Letter Book 50, and reads as follows:

"4th December, 1912.

The National Electric Welder Co.,
Warren, Ohio.

Dear Sirs:

I am sending you under separate cover, a copy of the Harmatta patent No. 1,046,066, which issued yesterday. The claims are apparently very broad.

Very truly yours,

J. NOTA MCGILL.

Copy enclosed."

X-Q. 77. Will you please produce the letter from Mr. McBerty to Mr. McGill, next preceding that of December 9th, 1912, having any reference to spot welding or electric welding?

A. The next preceding letter is one dated November 25, 1912, forwarding to Mr. McGill, copies of letters passing between The National Electric Welder Co. and Mr. Johann Harmatta, asking the latter with reference to his patent in the United States.

X-Q. 78. Is there any correspondence in your files on this subject in the years 1910 or 1911?

A. I find no such correspondence.

X-Q. 79. Is there any correspondence between January 1, 1912 and November, 1912, relating to the same subject matter?

A. I find a letter dated January 9, 1912, from The National Electric Welder Co. to Mr. J. Nota McGill which reads as follows:
"Warren, Ohio, 1-9-12.

Mr. J. Nota McGill,
Washington D. C.

Dear Sir:—

Some six weeks ago we requested Mr. Upton to secure for us copies of all patents relating to metal heating and working, and after having spoken to him about the matter a couple of times we have decided to take the matter up with your office, hoping to get more prompt attention to our requests.

We want to get in touch with what has been done in the electric welding line, with reference to welding machines both butt and spot welders, welding of rings, hollow ware, also anything in the arc welding which may be of interest.

We would ask that you kindly send us at your earliest possible convenience copies of these patents, together with bill for same.

We are now writing up two different matters to see whether we can get patents or not, and just as soon as we get these copies, if we find that we are not covering ground already gone over, we wish to take these matters up with you.

We regret to say that through some mistake of Mr. Upton's of getting the drawings signed for the lever switch, we have been unable as yet to get our patents issued.

Thanking you for your prompt attention, we are,

Very respectfully yours,
THE NATIONAL ELEC. WELDER CO.

Per

F. P. MCBERTY,
Treas.

FPM/Z"

Mr. McGill's answer to this letter is dated January 11, 1912 and appears at page 242 of Letter Book 47, and is merely advising of the number of copies of patents in those classes relating to welding and the cost of the copies. The letter will not be copied unless counsel shall request.

Cross-examination closed.

Mr. Church requests that the letter from Mr. McGill to Mr. Edwards, dated April 30, 1914, and referred to by the witness in his cross-examination be copied into the record, which is accordingly done, as follows:

"30th April 1914.

C. V. Edwards, Esq.,
2 Rector Street,
New York.

Dear Sir:

I thank you for your favor of the 27th instant, which I find upon my return to the city this morning. It seems to me that even if the answer did not lay foundation for evidence as to priority of invention, the court should have admitted it subject to an amendment to the answer, and anyhow ought to have allowed it under Zane vs. Soffe 110 U. S.

If printed briefs are used will you kindly let me have a copy.

Very truly yours,

J. NOTA MCGILL.

M.I."

Signature and Certificate Waived.

IN THE DISTRICT COURT OF THE UNITED STATES

EASTERN DISTRICT OF MICHIGAN

SOUTHERN DIVISION

IN EQUITY

THOMSON SPOT WELDER COMPANY

vs.

FORD MOTOR COMPANY.

Warren, Ohio, July 10, 1919, 3.30 P.M.

Pursuant to agreement of counsel.

Present: A. S. PATTISON, ESQ., Counsel for Defendant.

J. L. STACKPOLE, ESQ., Counsel for Plaintiff.

Deposition taken on behalf of defendant by agreement of counsel under the equity rules of the Supreme Court of the United States and under the Revised Statutes. Before me W. S. Helsley, Notary Public and Special Examiner.

WILLIAM B. ENSOR.

WILLIAM B. ENSOR, of lawful age, being by me first duly sworn to tell the truth, the whole truth and nothing but the truth, deposes and says as follows:

Direct examination by Mr. PATTISON:

Question 1. Please state your name and age?

Answer. My name is William B. Ensor, age twenty-nine.

Q. 2. Where do you live?

A. Leavittsburg, Ohio.

Q. 3. What is your present employment?

A. I am in the service department of the Peerless Electric Company.

Q. 4. When did your employment begin there?

A. I began working for them January 1, 1911.

Q. 5. Have you during your employment with the Peerless Company seen a rivetless fan blade at that factory?

A. I did at one time.

Q. 6. Under what circumstances did you see it?

A. Shortly after I went to work for the Peerless Electric Company I was put in the experimental department developing a new line of one phase motors and we were looking for some resistance coils in the old stock house among a collection of old fans and repair parts and returned goods and so forth for these resistance coils. Mr. Kargeau and I went to the old stock house and I ran across an old Stanley Patterson fan that had a peculiar looking blade on it which attracted my attention to it because it did not have any rivets. I asked Kargeau what the thing was and he looked at it in an easy going sort of fashion and said he didn't know. We

looked it over and I asked him how he supposed the thing was fastened on there and he said he supposed some kind of welding proposition. I saw the fan and I looked it over very carefully, being young in the business I was very much interested in it, pretty much interested in any new thing that came around. I didn't seem to be able to get any particular interest roused up in Kargeau and I didn't pay much more attention to it.

Q. 7. Whose manufacture of fan was it?

A. The Warren Electric & Specialty Company. It was an older type than the Peerless Electric Company.

Q. 8. And Stanley Patterson Company, who are they?

A. They were the New York Agent, jobbers of the Peerless Electric Company, they sold for both concerns.

Q. 9. Are you sure that the blade referred to by you was a rivet-less blade?

A. Oh, yes, no question about it. The blade was a black Japan blade and was perfectly smooth. My attention would not have been called to it if it had had rivets in it.

Q. 10. Where in the factory did you see the fan with the rivet-less blade?

A. It was on the rack of repairs and returned stuff, this returned goods in what we now know as the stock room, there was a rack there on which returned goods were put that might be useful for repairs at some future date. These old fans are pretty valuable to us to get repair parts from.

Q. 11. Returned fans. Please explain what you mean by that.

A. Well, fans that have been returned as defective or returned for exchange, or replacement. So many times customers want to change them, find some minor defect with the fan and they return it to us.

Q. 12. Did you examine this fan sufficiently to see if it had been previously used?

A. Oh, it had been used. There was nothing put in that place except fans that had been used.

Q. 13. They had been out to the trade and came back?

A. No new fans were put in there. I suppose the average man would call it a junk room.

Q. 14. What was the condition of the blade when you examined it?

A. I didn't see anything wrong with it, didn't notice anything wrong with it.

Q. 15. Did the blades seem to be held securely in place?

A. Seemed to be all right so far as I noticed. Just an ordinary fan blade except it didn't have any rivets. I didn't see anything wrong with it.

Q. 16. When a fan is placed in the factory where you saw the one referred to what if anything does that location mean?

A. Well, it would mean it was an old fan, I suppose it would mean it had been out in service, no new stuff was put in there of

any kind and nothing has ever been put there that would be of recent manufacture, it would be an old fan.

Q. 17. What became of the fan, or the rivetless blade, if you know?

A. I don't know, it just disappeared.

Q. 18. Did you look for it at any time?

A. I have looked for it but I have been unable to find it. I noticed it out there on a few different occasions after that when I was looking for more repair parts but I couldn't say exactly what time it disappeared because I was taken off that work and put on the same work I am now engaged in, in other words, the engineering of service repairs and I was on that work for I think about a year, then I was put in the assembling department as foreman and during that period I knew nothing about repair parts aside from the ones that came in my own department and I lost all track of this old stuff that lay in the old stock house.

Q. 19. What is the custom of the Peerless Company if called upon for a fan blade of the older type that they were not manufacturing at the time the call came?

A. Well, if we can find one of them we ship it. On numerous occasions I have taken blades off of old fans, some that were down in our basement on obsolete fans. I have made a practice of removing repair parts from these and shipping them out, it is the only way you have to get these obsolete parts. We have so many different parts of fans and motors that we do not attempt to carry in our finished stock duplicates of all these old repair parts and once in a while it happens that we do have them in the junk pile that I have mentioned before or in some other department of the establishment, returned fans that are mechanically defective, or certain parts of them and we take these parts and refinish them and ship them out to the customer for repairs.

Q. 20. Do you know Mr. Newton Smith?

A. I have met him.

Q. 21. Please explain the circumstances.

A. He has been in our plant, we were looking for fans. I think I was with him on just one occasion. He was looking for an old type of fan.

Q. 22. Did he buy one?

A. Yes, I think Mr. Smith bought a fan.

(By Mr. Stackpole: Mr. Smith being present says he bought a Colonial fan.)

(By the Wintess: Mr. Smith was in and bought an old type fan. He was unable to get the fan with the Peerless name plate on it so he took one with the Colonial plate on it and knew it was made by the same company and in every way the same fan.)

Q. 23. Was anything said about this rivetless fan blade you had seen to Mr. Smith?

A. I mentioned to him having found the thing. Expressed regret that I was unable to locate it at the present time.

Q. 24. Have you any interest whatever in this question of spot welded fan or of the McBerty welder?

A. Not in the least.

Q. 25. Or of the result of this suit?

A. Not in the least.

Q. 26. Will you please give the full name of Kargeau to whom you have referred?

A. Theodore is his first name, he always wrote his name as T. Kargeau but Theodore is his name.

Q. 27. Do you know where he is now?

A. No, I do not, he went from here to Sarasota, Florida, he went on a fruit farm down there.

Q. 28. And that place in Florida you have referred to?

A. Sarasota.

Q. 29. How long since you heard from him?

A. Oh, I haven't heard from him for five years, I should say.

Q. 30. When did you meet me?

A. Yesterday.

Q. 31. Where?

A. Peerless Electric Company.

Q. 32. Who introduced me to you?

A. Mr. McBerty.

Cross-examination by Mr. STACKPOLE:

X-Q. 33. Before you testified today were you shown Plaintiff's Exhibit Thirty-eight?

A. May I ask the counsel a question, if that is the same picture he showed me? It looks like the same picture, yes.

X-Q. 34. Are you sure?

A. Yes, that is the same picture I saw or one just exactly like it. That is a picture of the type G fan.

Re-direct examination by Mr. PATTISON:

Re-D. Q. 35. When did I show you this picture?

A. About five minutes ago.

Re-D. Q. 36. In the other room just before you came in to testify?

A. Yes.

IN THE DISTRICT COURT OF THE UNITED STATES
EASTERN DISTRICT OF MICHIGAN
SOUTHERN DIVISION
THOMSON SPOT WELDER COMPANY
vs.
FORD MOTOR COMPANY.

Met pursuant to agreement of counsel.

Present: J. L. STACKPOLE, ESQ., counsel for plaintiff, and
A. S. PATTISON, ESQ., counsel for defendant.

Depositions taken on behalf of defendant under the Equity Rules of the Supreme Court of the United States, and under the Revised Statutes, before Carl D. Rice, Esq., Notary Public and Special Examiner, at Warren, Ohio, July 24, 1919.

JOHN B. ESTERBROOK.

JOHN B. ESTERBROOK, a witnessed called in behalf of the defendant, being first duly sworn, deposes as follows:

Direct examination by MR. PATTISON:

Question 1. What is your full name, and residence?

Answer. John B. Esterbrook, Warren, Ohio.

Q. 2. What is your present occupation?

A. Secretary and Treasurer of The Sun Light Electric Manufacturing Company.

Q. 3. How long have you been connected with that company?

A. Two years.

Q. 4. What was your occupation prior to your connection with the above mentioned company?

A. Secretary and salesman of The Peerless Electric Company.

Q. 5. Were you with the Peerless Electric Company in that capacity during the year 1913?

A. Yes, sir.

Q. 6. Are you acquainted with Mr. Fred P. McBerty of this city?

A. Yes, sir.

Q. 7. About how long have you known him?

A. I believe twenty-five (25) years.

Q. 8. While you were occupying that position with The Peerless Electric Company of this city, do you recall that Mr. McBerty came to that factory, the factory of that company, with another gentleman to make a search?

A. Yes, sir.

Q. 9. What, if you know, was the search for?

A. Mr. McBerty told me that he was looking for a spot welded fan blade.

(Mr. Stackpole: I object to the answer as hearsay.)

Q. 10. Was such search made?

A. Yes, sir.

Q. 11. Did you take any part in the search?

A. Yes, sir, I went over into the factory with them.

Q. 12. With Mr. McBerty and the other gentleman?

A. Yes, sir.

Q. 13. What did you search for?

A. I took Mr. McBerty and the other fellow into our room where we kept all of the obsolete fans and fan parts, and dug up for them all of these parts and completed blades that were there.

Q. 14. What were they looking for?

A. A spot-welded fan.

(Mr. Stackpole: I object to the answer as incompetent and hearsay.)

Q. 15. Did this other gentleman know what they were looking for?

(Mr. Stackpole: I object to the question as incompetent.)

A. Undoubtedly.

Q. 16. To what extent was the search made, as you remember?

A. We went through all the bins, and everything that was in that room, and dug up all the fan blades and fan parts that were there, and Mr. McBerty looked them over.

Q. 17. Did the search include that place where old fans would be placed that were returned from the trade, after having been on the market?

A. All obsolete types of fans were kept in that room, both fans that came back, and parts that had never been shipped out.

Q. 18. Can you state whether a spot-welded blade was found in this search?

A. Not to my knowledge.

Q. 19. State whether or not this search was the only occasion that you went with Mr. McBerty and another gentleman to look through the factory for old fans and fan blades?

A. That is the only search I helped make personally.

Q. 20. Do you recall the name of the gentleman that was with Mr. McBerty?

A. No, I do not.

Q. 21. State whether or not this search included more than one part of the factory?

A. It included this room I have described; it included the warehouse where there were some old fans; and it included the third story of the main building where there were some more fans.

(Mr. Pattison: That is all.)

Cross-examination by MR. STACKPOLE:

X-Q. 1. Was the other fellow with Mr. McBerty a lawyer, who was investigating the alleged spot-welding?

A. I can not tell you whether he was a lawyer or not. He was the man that came there with Mr. McBerty in the interest of this same proposition.

X-Q. 2. That was in the fall of 1913?

A. I would not say definitely in regard to that. I would say it was five (5) or six (6) years ago, in that neighborhood.

X-Q. 3. Was the other fellow's name Thomas Howe?

A. I don't know, sir.

X-Q. 4. In this search did you find any fans with steel blades?

A. Mr. McBerty inspected all of that stuff himself. I don't know what we dug up for him, I can not say.

(Mr. Stackpole: That is all.)

Certificate and signature waived by consent of counsel.

F. P. McBERTY.

F. P. McBERTY, a witness, who has previously testified in this case, being recalled in behalf of the defendant, testifies as follows in response to questions by MR. PATTISON:

Direct examination by MR. PATTISON:

Question 1. Are you the F. P. McBerty who testified in this case in Detroit before Judge Killitts, about some early spot welding that you did?

Answer. Yes, sir.

Q. 2. I believe you know Mr. Thomas Howe who has testified in behalf of the plaintiff in this case?

A. Yes, sir.

Q. 3. When did you meet him?

A. I met him in the fall of 1913.

Q. 4. What was the occasion of your meeting Mr. Howe?

A. Mr. Howe came to Warren to assist in collecting evidence in reference to the use of electric spot-welding machines.

Q. 5. What, in a general way, did Mr. Howe do in the way of investigating this question of spot-welding?

A. Mr. Howe went with me to different places to meet men formerly employed where the spot-welder was used. He also went with me to the plant of The Peerless Electric Company to assist in a search for any spot-welded fan blades we could locate.

Q. 6. You testified in this case at Detroit, and among other

things, you said, that you spot-welded a number of complete fan blades at The Warren Electric & Specialty Company, of Warren, Ohio, in 1901, which passed through that factory, and were put on completed electric desk fans that went out to the trade. Did you tell Mr. Howe about this when he was with you investigating the subject in 1913?

A. I did.

(Mr. Stackpole: This line of examination is objected to, if it is to impeach the testimony of this witness whose testimony has already been given.)

(Mr. Pattison: This witness has already testified that he had told Mr. Howe of these facts in 1913.)

Q. 7. What, if anything, was done by either you or Mr. Howe, or both, to obtain some tangible evidence of the making of the blades and putting them on completed fans that went to the market?

A. Mr. Howe and I went to the plant of The Peerless Electric Company, successors of The Warren Electric & Specialty Company, and made as detailed a search as we could possibly do, with a view of locating either a fan with spot-welded blades, that is a completed motor, and failing in that, to locate a spot-welded fan blade itself independent of the motor. This was done by going over the stock of old fans that had been sent out to the trade by The Warren Electric & Specialty Company and later returned for any reason whatever; and also by searching through numbers of trays which were filled with fan blades of various kinds and shapes that were in stock at the plant of The Peerless Electric Company, such fan blades being carried from year to year to replace blades that had been destroyed or lost.

Q. 8. Who was present during this search?

A. Mr. J. B. Esterbrook and Mr. Thomas Howe.

Q. 9. What was the reason for looking among the returned fans that had been out to the trade and come back to The Warren Electric & Specialty Company for some reason?

A. Mr. Esterbrook advised me that, in years prior to the date of this search, they had disposed of practically all the fans they had in the plant, and consequently any fan blades, or any blades that were spot-welded, would have gone out on the market; and our only chance of locating such a fan, he considered, would be found among the so-called second-hand or returned fans.

(Mr. Stackpole: I object to the answer as being hearsay.)

Q. 10. Did Mr. Howe understand the object of this search?

A. He certainly did.

Q. 16. Did he understand why you were looking among the second-hand or returned fans?

A. Yes, sir.

Q. 17. What did he understand about this?

(Mr. Stackpole: I object to the question as being incompetent.)

A. That was the only chance—That was our best chance to find a blade of this type—That our best chance to find a blade of this type would be to find it among some of the fans that had been sold by The Warren Electric & Specialty Company, and later on returned.

Q. 18. Was a spot-welded fan blade found on the occasion of this search?

A. No. We were unable to find any spot-welded fan.

Q. 19. What was Mr. Howe's attitude in respect to this matter?

(Mr. Stackpole: I object to the question as being incompetent.)

A. Mr. Howe's attitude was that it would be advantageous evidence if we could locate such a fan blade, as a positive demonstration of the prior use of spot-welding.

Q. 20. What were you endeavoring to establish for Mr. Howe, in making this search?

A. I wanted to prove to Mr. Howe that the fan blades had been spot-welded and sent out as a commercial product; and to secure sample of a completed specimen of a spot-welded blade, if possible.

Q. 21. You mean an original spot-welded blade that had been sent out to the trade and returned?

A. One of the original spot-welded blades that had been made in 1901, and had been sent out during that time, or about that time.

Q. 22. During your testimony in Detroit an affidavit was made by you in 1913, and drawn up by Mr. Howe, and offered in evidence on behalf of the plaintiff. State why, if you know, this affidavit makes no mention of the making of several spot-welded fan blades in 1901, which went through the factory and went out to the trade?

A. This affidavit, mentioned, was made to Mr. Howe after we had made a very thorough search for a completed blade that was welded in 1901. And Mr. Howe's suggestion was, that unless we had some positive, tangible evidence of such work having been done, that is, unless we could locate a blade and positively identify it as having been made at that time, it would be better policy to merely confine ourselves to a statement of the spot-welding done, and the sample we had, which was tangible.

Q. 23. You mean confine yourselves to the specimens that were attached to your affidavits?

A. Yes, attached to the affidavits already in hand.

Q. 24. If it had been that you did not tell Mr. Howe about

making a number of spot-welded fan blades, and sending them out to the trade, what possible reason could there have been for the search that you and he made at The Peerless Electric Company?

A. Absolutely no reason at all. The only desire was to locate a spot-welded fan blade.

Q. 25. What was the character of the interview that Mr. Howe had, in 1913, with Mr. John McDonald, who has testified for defendant in this case?

(Mr. Stackpole: I object to the question, as not calling for facts, and as being incompetent.)

A. His interview, so far as securing evidence in reference to this spot-welding, was very brief, and, in my judgment, unsatisfactory.

Q. 26. Did Mr. Howe on this visit ask Mr. McDonald to think the matter over and recall all that he possibly could, and that he would call to see him again?

A. No, he did not.

Q. 27. Did he, so far as you know, call upon Mr. McDonald again?

A. I never knew of his seeing Mr. McDonald other than that one time, until he saw him in Detroit recently.

Q. 28. About how much time was spent in this interview with John McDonald in 1913, in respect to this spot-welding proposition, and the electric welder?

A. The interview, in reference to the use of the electrical welder, and spot-welded blades, would not cover a period of more than three (3) to five (5) minutes all told. It was very brief.

Q. 29. What was Mr. McDonald's occupation at that time?

A. A farmer.

Q. 30. Was this an unexpected call on Mr. McDonald?

A. Yes, sir.

Q. 31. Had he been given any opportunity to try to recall or remember any of the facts about this spot-welding proposition?

A. No, sir, not at all.

Q. 32. I believe you are acquainted with John Gilder, who has testified in this case for the defendants?

A. Yes, sir.

Q. 33. Mr. Gilder and Mr. Howe have testified that Gilder was interviewed in 1913 by Mr. Howe in respect to this spot-welding proposition. Were you present during this interview?

A. I was present at one interview, to my knowledge.

Q. 34. About how long would you say that this interview lasted altogether?

A. My recollection would be, it lasted ten or fifteen minutes.

Q. 35. Had Mr. Gilder been given any previous opportunity to think about this early welding proposition before the interview?

A. Not to my knowledge.

Q. 36. When Mr. Howe was in Warren in 1913, investigating

this early spot-welding of yours, did you recall at that time that any catalogue of The Warren Electric & Specialty Company disclosed a fan with a spot-welded blade thereon?

A. No, I did not.

Q. 37. Did Mr. Howe suggest looking for any of the catalogues of The Warren Electric & Specialty Company, or The Peerless Electric Company, in this connection?

A. No, he did not.

Q. 38. Or about an examination of any other trade publications?

A. No, he did not.

Q. 39. How did you happen to discover The Warren Electric & Specialty Company's catalogue of 1901, with the illustrations of the G-2 fans, which you say are spot-welded?

A. This was brought about by request made by Mr. Pattison regarding catalogues and methods of advertising these fans and describing same.

Q. 40. Was there any search made in response to this request of Mr. Pattison's?

A. Yes. Immediately after the suggestion was made that there might be catalogues available, or at least it would be policy to search for such catalogues and descriptive matter, I went to the plant of The Peerless Electric Company, successors of the Warren Electric & Specialty Company, and asked their Mr. W. C. Ward, Manager of The Peerless Electric Company, whether there were any of the old catalogues still in existence illustrating the line of fans produced in 1900, 1901 and 1902.

Q. 41. What was the result of this search?

A. Mr. Ward very promptly advised me that such catalogues were in existence, and searching in the drawer of his desk, he handed me a 1901 catalogue, which gave a detailed description and cuts of the various types of fans manufactured by The Warren Electric & Specialty Company in 1901 and placed on the market at that time.

Q. 42. Were these catalogues available in 1913, when Mr. Howe was in Warren?

A. Yes, sir, they were.

(Mr. Pattison: Opposing counsel is asked whether any affidavits were called for during Mr. McBerty's testimony in Detroit, that he now wishes to be produced. If there are any in existence counsel for defendant will be very glad to produce them for opposing counsel.)

(Mr. Stackpole: The record will show whether any affidavits were asked for. The affidavits of Messrs. McBerty, Brown, Lipps, and others are already in the case, and seem sufficient.)

Q. 43. Are you acquainted with William B. Ensor, of Warren, Ohio.

A. Yes, sir.

Q. 44. Mr. Ensor has testified for the defendant in this case. When, and under what circumstances, did you meet Mr. Ensor?

A. I met him at the plant of The Peerless Electric Company recently, while making a search through the stock of old fans at the plant of The Peerless Electric Company.

Q. 45. What were you looking for?

A. I was endeavoring to locate a spot-welded fan blade on any returned fans that they might have in the factory or storehouse.

Q. 46. Did you find any?

A. No, I was not successful in finding any fan blade of that type.

Q. 47. What, if anything, did you learn at that time regarding spot-welded fans?

(Mr. Stackpole: I object to the question as calling for hearsay.)

A. I explained to Mr. Ensor the particular type of fan blade I was endeavoring to locate, and I was advised by him that, shortly after he became connected with The Peerless Electric Company, which was in 1911, that he saw such a fan blade on an old fan motor that had been returned; and owing to the peculiar construction of the blade, which was a blade without rivets, it attracted his attention; and he examined it quite thoroughly.

(Mr. Stackpole: What Mr. Ensor told the witness is objected to as hearsay.)

Q. 48. Were you the first one that Mr. Ensor told this to?

(Mr. Stackpole: I object to the question as incompetent.)

A. Mr. Ensor had taken this matter up also with the former chief engineer of The Peerless Electric Company.

(Mr. Stackpole: I object to the answer as being hearsay.)

Q. 49. What was his name?

A. Theodore Kargeau.

Q. 50. Did Mr. Ensor tell anyone else besides Kargeau before he told you?

A. I believe he also mentioned this matter to Mr. Hadly.

(Mr. Stackpole: I object to the answer as being hearsay.)

Q. 51. To anybody else?

A. Not to my knowledge. I made a misstatement right there.

Q. 52. If you have any correction to make in your answer, please do so.

A. He also told Newton A. Smith, the representative of The Thomson Spot Welder Company.

Q. 53. He told Mr. Smith before he told you?

(Mr. Stackpole: I object to the question on the ground it is incompetent and hearsay.)

A. He did.

Q. 54. During this occasion with Mr. Ensor, was an effort made to find this spot-welded blade?

A. Yes. After Mr. Ensor told me of this spot-welded blade that he had seen there, we made a very thorough search for it; thinking possibly it might still be at the plant of The Peerless Electric Company somewhere.

Q. 55. About when was this last search with Mr. Ensor, to which you referred?

A. In the month of June or July, 1919.

Q. 56. Have any efforts been made to locate Theodore Kargeau?

A. Yes, I have done practically everything I could to locate Mr. Kargeau. I telegraphed to the last known residence place of Mr. Kargeau, and I telegraphed to the postmaster at that town regarding his present whereabouts; and I have also telegraphed to parties who might possibly have some knowledge of his present whereabouts; but have been unable to locate him.

Q. 57. Mr. Thomas Howe, in answer to question 7, intimates that in 1913 he took to Warren a specimen spot-welded fan blade, that had reached Mr. Edwards through your attorney, Mr. McGill. Did he show you that specimen when he was investigating the question in 1913 in Warren?

A. Not to my knowledge.

Q. 58. Mr. Howe, in answer to question 11, gives the impression that you never told him of making more than one complete fan blade; and didn't tell him any spot-welded blades were assembled in complete desk fans that went out to the trade. Have you anything to say about this?

A. Mr. Howe's memory, in connection with this matter, is not good; as that was gone over very thoroughly, in detail the prior work that had been done on spot-welded blades. And his final judgment was, we should confine our testimony in reference to this spot-welding on actual samples we had on hand.

Q. 59. Mr. Howe says that when he was here in 1913, you didn't give him the name of William E. Smith as a former employee, who might know about the welder and work done on it. What is your recollection about that?

A. My impression in connection with this is, that we were at that time interested in workmen only connected with the fan motor department; and Mr. William E. Smith was directly connected with

the transformer department, and didn't get on the list of fan motor operators or producers, and was therefore overlooked.

Q. 60. About when, if you remember, and how, if you remember, did you learn that Mr. William E. Smith did know something about this spot-welding proposition?

A. This was brought to my attention, I think, two or three years ago, owing to the fact that some of the men I had talked with in connection with the spot-welding remembered that Mr. Smith had, at various times, worked in the fan motor department. And on inquiry of Mr. Smith, I found he was quite familiar with the entire process.

Q. 61. In answer to question 20, Mr. Howe says your welder in 1913 was incomplete in many respects. Have you anything to say about this?

A. The welder was complete in every detail, with the exception that I did not have the original spot-welder electrodes that I had used; and the machine was not mounted on a pedestal or base to permit its being operated. Otherwise, it was in the identical condition it is today.

Q. 62. Did Mr. Howe ask you to assemble the machine and operate it for him?

A. No, he did not.

Q. 63. Did he manifest any interest in seeing it operate?

A. No, he did not.

Q. 64. Mr. Gravell, a witness for the plaintiff, has testified in regard to the character of the spot welds on the fan blade that you spot-welded on your old machine at the Ford plant in the presence of Judge Killitts; and he calls attention to the fact that some of the welds on that exhibit (Defendant's Exhibit 56) stand obliquely in the metal. Have you anything to say in respect to this?

A. The demonstration, made at the plant of the Ford Company on this welder, was not made with a view of making as nice and as workmanlike a job as could be done; it was merely to demonstrate that the machine would spot-weld, and had ample capacity to do this work. And all that would have been necessary to make a perfect job would have been to dress up the points to the proper shape, and it would have made as satisfactory a weld as could be made with any spot-welder.

Q. 65. In spot-welding commercially, with the modern spot-welders of today, are all of the spots, of the series, which may be made on one piece of work exactly the same?

A. They are not. They vary, depending entirely on the amount of pressure applied, and the length of time the current is kept on.

Q. 66. What effect does the repeated use of the electrodes have on the appearance of the work?

A. The repeated use of the electrodes have a tendency to make it cup-shaped; has a tendency to press up around the outside edge of the electrodes, making a rougher weld.

Q. 67. Will the deepest part of the recess, made by the electrodes, be always in the center of the weld?

A. Not always. It depends entirely on how the work is held in position.

Q. 68. What is the result, in modern, commercial welding, spot-welding, so far as any oblique appearance of the welds is concerned?

A. The majority of the spot-welding work done has a projection on one side or the other of the welds, on the face of the sheets. The heat of the metal has a tendency to force up the metal around the welded point.

Q. 69. The witness Wagner for the plaintiff calls attention to the fact that The Warren Electric & Specialty Company's catalogue for 1901 (Defendant's Exhibit 2) does not describe that the blades of any of the fans are copper or nickel plate; but that it does state "other finishes if specified." What does "other finishes if specified" mean in this catalogue?

A. The standard finish on the high grade fans is brass, polished and lacquered; but the company stood at all times prepared to furnish copper-coated, oxidized, and nickel-plated fan blades, and other metal trimmings, upon request from the customer.

Q. 70. Mr. Edwards, a witness for the plaintiff, was attorney for the defendant in the Barney & Berry case, frequently referred to herein, and in answer to question 12 in this case, he gives the impression that it was at your initiative that he asked you in the Barney & Berry case, about your spot-welding, which you were not permitted to state at that trial. What have you to say about this?

A. Apparently Mr. Edwards' memory does not serve him well in this particular instance. I was telegraphed to to come to Boston immediately. In other words, urged to make haste. I went down there with a view of assisting them, by supplying any information available, but not with the intention or understanding I was to be called to the stand at all on that case, as I had not been prepared in any way, and knew nothing about how the case was to be handled.

Q. 71. How long prior to the trial was it you received this telegram—How long prior to the trial of The Barney & Berry case, was it you received this telegram?

A. My impression is that Mr. Frank Warren telegraphed to me on the last day of March, to be in Boston on the 1st day of April, or the following day, prepared to attend this case.

Q. 72. Did you request that you be called as a witness in The Barney & Berry case?

A. No.

Q. 73. Did you request that you be asked about your spot-welding in the Barney & Berry case?

A. No. I had no intention of being called to the stand.

Q. 74. Did you have anything with you at all relating to your prior spot-welding?

A. No.

Q. 75. In answer to question 11, Mr. Edwards says, that he had a conference with you, after the affidavits were obtained by Mr.

Howe, and that you told him (Mr. Edwards) that none of your spot-welded blades were put into use, or went out commercially. How about this?

A. I believe Mr. Edwards' memory fails him there again. I gave Mr. Edwards all the information I had given Mr. Howe, as well as what Mr. Howe had told him regarding prior use. And he also knew, I am quite confident, regarding our search for that spot-welded fan blade.

Q. 76. Did you tell him that the spot-welded fan blades were not adopted as a regular manufacturing proposition at The Warren Electric & Specialty Company's plant?

A. Yes, I told him that.

Q. 77. Plaintiff's witness, Curtiss Brewer, has testified in this case, in answer to question 50, that the fan blades, that The Warren Electric & Specialty Company used were received from an outside firm, with the rivet holes being punched. State what you know about this during the time you were with The Warren Electric & Specialty Company, including, as I understand it, up to the time that company sold out in 1902.

A. Mr. Brewer is mistaken in reference to that statement. As I, being in charge of the designing and construction of these fans, personally saw to it that dies were made for producing fan blades when we first started to manufacture fans. And from that time on, during my entire connection with The Warren Electric & Specialty Company, we stamped out all our own fan blades, both brass and steel. To my knowledge they never purchased blades at any time from outside sources.

Q. 78. In what form did the material come to the Warren Electric & Specialty Company, out of which the blades were stamped?

A. The brass came in sheets of the proper width to cut fan blades crosswise on the sheet, and in lengths from 6 to 10 feet long in boxes. And the steel came in boxes and bundles of the same general shape, straight sheets, from which to punch the blades.

Q. 79. The same witness, in answer to question 46, says, that the blades that the Warren Electric & Specialty Company used were of iron. State what you know about this, during the time that you were with the company.

A. Some of the blades produced in 1901, and later, were all of what we call cold-rolled, machinery steel. This sheet steel all the scale had been removed, and was smooth on the outer surface, and was reasonably soft. And this steel we used in stamping out the blades for the cheap fan.

Q. 80. Were any iron blades used by The Warren Electric & Specialty Company, as distinguished from the steel to which you have just referred?

A. Not to my knowledge.

Q. 81. What kind of spiders were used on the steel blades?

A. A steel spider was also used.

Q. 82. How were these made?

A. These were also punched out of sheet steel, but it was not as high-grade sheet steel, or with as fine a finish, as the material that the blades were produced from.

Q. 83. This same witness has testified, in answer to questions 22 to 24, that your welding machine was built on a block of fibre, about 8 by 10 inches, and about an inch thick. Was your machine mounted at any time on a block of fibre?

A. It was not.

Q. 84. Was your welding machine at any time mounted on a block, or anything, that substantially corresponds to the dimensions given by the witness?

A. After the machine was taken over by The Peerless Electric Company it was supplied with a base made of slate, which I would say, was about 8 by 10 inches by fifteen-sixteenths or seven-eighths inches thick. And this slate base was with the welding machine when it was purchased by myself in 1911 from The Peerless Electric Company, and is now with the machine in Detroit in custody of the Court.

Q. 85. Was your welding machine mounted on a block of fibre, or any other kind of block, as defined by Mr. Brewer, while it was owned by The Warren Electric & Specialty Company?

A. It was not.

Q. 86. The evidence in this case shows that when The Warren Electric & Specialty Company sold out its fan department to The Peerless Electric Company in 1902, this welding machine was moved over to another building in custody of The Peerless Electric Company. State whether this slate block, to which you have referred, was used with the machine before, or after, it was moved from The Warren Electric & Specialty Company?

A. It never was used with the machine before it was moved. How long afterwards, I don't know.

Q. 87. Do I understand from this, that your welding machine was mounted on a slate block or slab after it was moved to The Peerless Electric Company in 1902?

A. Yes, it was.

Q. 88. As I understand your testimony, given in this case, the spot-welding of blades all occurred on this machine while it was with The Warren Electric & Specialty Company?

A. All done in the early part of 1901, while at the plant of The Warren Electric & Specialty Company.

Q. 89. How was your welding machine mounted at The Warren Electric & Specialty Company, prior to putting it on the slate base at The Peerless Electric Company?

A. It was built to the top of a hard-wood bench, with the bed of 2 angle irons extending out from the edge of the bench some distance.

Q. 90. State whether or not its mounting at The Warren Electric & Specialty Company is correctly represented in its present mounting in this case?

A. As near as we could duplicate the original conditions.

(Mr. Pattison: The direct examination is closed.)

Cross-examination by Mr. STACKPOLE:

X-Q. 1. You say that the slate base of your welder is with the machine now in Detroit, in the same box with the machine?

A. It is my impression it is in a smaller box, which is down inside of the crate.

X-Q. 2. And that is a slab of slate 8 by 10 inches?

A. Approximately so.

X-Q. 3. And about $\frac{7}{8}$ of an inch, or thereabouts, thick?

A. Yes.

X-Q. 4. Is the slate base cut, or carved, or plain?

A. It has a hole in the center to permit the bed of the welder to extend down through.

X-Q. 5. How big is that hole?

A. I would say it is $2\frac{1}{2}$ by 8 inches.

X-Q. 6. How can you get a hole that size in a plate 8 by 10?

A. You can drill it in, or saw it in, or any other way. You have still an inch of material at each end, and considerable material out on each side.

X-Q. 7. What is the object in using slate?

A. That, I think, was done to conform to more rigid electrical specifications, which had gone into effect in the installation of electrical apparatus in later years.

X-Q. 8. What became of the specimen you say you showed Mr. Fish at the time of the trial of the Barney & Berry case?

A. That was later on turned over to Mr. J. N. McGill, and, as I understand, was in turn given to Messrs. Edwards, Sager & Wooster.

X-Q. 9. You say you showed this to Mr. Fish at the time of the Barney & Berry case, was that about March or April 1914, or 1915?

A. That was 1914. My interview with Mr. Fish, I think, was the late fall of 1912, or the early spring of 1913.

X-Q. 10. While you were recently making a search with Mr. Ensor in The Peerless Company's plant for fans, did you find any G-1 or G-2 fans?

A. I do not believe we found any of the original G-1 or G-2 fans.

X-Q. 11. What became of the statement that Mr. McDonald gave you in 1913, or thereabouts?

A. That is something that I cannot answer definitely; but my impression is that it is still among the correspondence of The National Electric Welder Company. As this statement was left at our office for Mr. McDonald to call for and sign. But he never did.

X-Q. 12. In your search in The Peerless Company's plant in 1913, did you find any G-1 or G-2 fans?

A. Yes, we found several of those old fans at that time.

X-Q. 13. So far as you know, they have since disappeared?

A. Yes, they have all been disposed of in one way or another.

X-Q. 14. Did both the old G-1 and G-2 fans have steel spiders?

A. Yes, the regular product did.

X-Q. 15. And these steel spiders were they the same shape?

A. The same shape, and the same size in both the 12 and 16 inch fans.

(Mr. Stackpole: That is all.)

Re-direct examination by MR. PATTISON:

Re-D. Q. 1. Were you asked by any one in connection with The Barney & Berry case to have your machine ready to demonstrate its operation for that case?

A. No, sir. I was not.

Re-D. Q. 2. I will ask you to state whether the G-1 fan, in the 1901 catalogue, shows a fan blade of the standard construction for that type of fan?

A. No. I would say that it did not, as the fan blade shows three (3) rivets per blade, which would indicate it had a brass center. This would not be standard production for that type and grade of fan.

Re-D. Q. 3. What is the standard production for that type and grade of fan?

A. A steel blade, with a steel center, and two (2) rivets per blade.

Re-D. Q. 4. How are these two (2) rivets located?

A. The two (2) rivets are located centrally on the blade, and about $2\frac{1}{4}$ inches apart.

Re-D. Q. 5. How were they arranged in respect to the blade, transversely, or longitudinally.

A. Longitudinally.

Re-D. Q. 6. State what kind of blade is illustrated on the G-2 type of fan in the 1901 catalogue?

A. That is a spot-welded blade, steel, with a steel center,

Re-D. Q. 7. What is the shape of the center of that blade?

A. The center has four (4) arms, attached to the steel hub, with the arms extending out from the center, and slightly tapering out to the outer end, that is more so than they are closer to the hub.

Re-D. Q. 8. State whether the spider of the blade in the cut G-2, in the 1901 catalogue, is the same shape as the spider of the fan blade which you spot-welded at the Ford plant in the presence of Judge Killitts, which I think is Defendant's Exhibit 56?

A. The spider would be the same shape identically.

Re-D. Q. 9. Is it the same size, or a different size?

A. The same size

Re-D. Q. 10. Do you mean by this that the same size steel spider was used for the G-2 and G-1 type fans?

A. Yes, it was. Never had but the one size die for stamping out steel spiders.

(Mr. Pattison: That is all.)

Re-cross-examination by MR. STACKPOLE:

Re-X-Q. 1. Besides the cut of G-2, found in the 1901 catalogue, have you any other evidence of the shape of the steel spider used in these G fans?

A. Yes, we have. The Peerless Electric Company are still using the original dies made at that time.

Re-X-Q. 2. Have you any other evidence than your recollection?

A. Samples of the spot-welding, which I have submitted in connection with my affidavit.

Re-X-Q. 3. Anything else.

A. That is all I have, to my recollection.

Re-X-Q. 4. The cuts of these fans, G-1 and G-2, bear the name "Manz, Chicago." Were the fans themselves sent to Manz of Chicago to be photographed?

A. That is something I cannot say. Sometimes we sent them out, and sometimes we had a local photographer take them.

Re-X-Q. 5. If Manz at Chicago took the photographs, would you say that the fans were sent to Chicago, or not?

A. If Manz took the photographs, I would say yes. But that mark on there indicates that Manz made the cuts, and does not indicate that he made the photographs at all.

Re-X-Q. 6. Do you know who did make the photographs?

A. I am not in a position to say.

Re-X-Q. 7. Do you know whether the photographing of the fans for this catalogue was done as one job, or some at a subsequent time or not?

A. No. I would not want to make a definite statement on that either.

(Mr. Stackpole: That is all.)

Re-direct examination by MR. PATTISON:

Re-D. Q. State whether or not Defendant's Exhibit M, which was offered during your testimony in Detroit, with your name and date on it, contains a spider of the same size and material as would be in the blade of the G-2 fan in the 1901 catalogue?

A. It does.

❖ (Mr. Pattison: That is all.)

(Certificate and signature waived, by consent of counsel.)

Mrs. Zella A. McBerty.

(Mr. Stackpole: No cross-examination.)

Certificate and signature waived by consent of counsel.

MRS. ZELLA A. MCBERTY.

MRS. ZELLA A. MCBERTY, a witness called on behalf of defendant, having been duly sworn, testifies as follows in answer to questions by Mr. Pattison:

Direct examination by MR. PATTISON:

Question 1. Please state your name and residence.

Answer. Zella A. McBerty, 29 Washington Avenue, Warren, Ohio.

Q. 2. What is your present occupation?

A. Secretary and Treasurer of The Federal Machine and Welder Company.

Q. 3. What was your occupation prior to your connection with The Federal Machine & Welder Company?

A. Assistant Secretary and Treasurer of The National Electric Welder Company.

Q. 4. While you were with the National Company, was a Mr. Newton Smith in the employ of that company?

A. Yes.

Q. 5. What was his employment there?

A. Shop Superintendent.

Q. 6. Approximately, how long was he with The National Electric Welder Company?

A. I can not say definitely as to the exact dates; but he came in the winter and left in the early spring of 1917.

Q. 7. Did his employment cease there while you were with that company?

A. Yes.

Q. 8. What was the reason of his leaving the company?

A. Well, I would say, because he was not satisfactory.

Q. 9. Was there any complaints about him from anyone in the office of the company?

A. Yes. One of my stenographers made complaint to me that he made himself rather obnoxious, in looking over letters which she was writing, and correspondence that was laid on her desk that she was to answer for Mr. McBerty.

Q. 10. Was he caught spying around the plant?

A. I noticed Mr. Smith a couple of times looking over the mail on Mr. McBerty's desk.

Q. 11. Did you catch him at any time other than these?

A. One time at the safe. I hadn't locked it up, and I came back in the office after working hours, and he was at the safe, and had opened up the doors. And he said to me, when I came in, "You have forgotten to lock the safe." I said, "I notice I did."

Q. 12. What was the reason for this spying of Mr. Smith's in the National Company, if you know?

A. He was in the employ of The Thomson Spot-Welder Company.

Q. 13. State, if you know, what he was trying to find out at The National Company?

A. As much as I can say, he was trying to see if we had spot-welders that were not under the lease and license arrangement with The Thomson Spot-Welder Company, as per agreement with The National Company. I don't know of any other reasons, although I presume there were several, but that would be the most important to my mind.

Q. 14. Did he leave himself, or was he discharged?

A. I think he handed in his resignation to Mr. McBerty.

Q. 15. At the time he left did you regard him as a spy, sent to your place?

A. I would not say that I did. Because he had told us, when he came into our employ, that he had no connection, and knew nothing of The Thomson Spot Welder Company.

Q. 16. Were you suspicious of him prior to the time you found him in the safe?

A. No, I would not say I was. Although we certainly criticised his work, and thought there was something radically wrong, because our production was not up to standard, and we were endeavoring all we could to help it, and he did not seem to want to help as we thought he should.

Q. 17. How did you happen to find him in the safe?

A. Well, one of the girls in the office had remarked that she thought it peculiar that Mr. Smith knew the combination of the safe, as she thought I was the only one that did. She said, that one morning, I was late, and they wanted to get into the safe, and he and Mr. Johnstone, who was at that time in our employ, opened up the safe; either Mr. Smith or Mr. Johnstone, I can't say which. Then after these various things had come up, his looking at the correspondence, and such things, I was a little bit suspicious.

Q. 18. How was it that you came back to the place, after leaving the office, and found Mr. Smith in the safe?

A. Because I wanted to see what he would do under those conditions.

Q. 19. Under what conditions?

A. I had left the safe unlocked, and I said I would take the mail sack down, which was not customary; and I drove out a little ways, and turned around and came back, and went into the office quietly, and he was at the safe, and had opened the doors.

Q. 20. Did you leave the doors of the safe closed when you left?

A. Closed, but not locked.

Q. 21. When you came back you found him there with the doors open?

A. Yes, sir.

John S. Gilder.
Edward L. Betteker.

(Mr. Pattison: That is all.)

(Mr. Stackpole: I have no cross-examination. The entire deposition is objected to as being irrelevant and immaterial, and is not sur-rebuttal.)

Certificate and signature is waived by consent of counsel.

JOHN S. GILDER.

JOHN S. GILDER, a witness, who has heretofore testified in this case on behalf of the defendant, testifies as follows in answer to questions by Mr. Pattison:

Direct examination by MR. PATTISON:

Question 1. You are the John S. Gilder who testified in this case at Detroit?

Answer. Yes, sir.

Q. 2. At Detroit you testified about doing butt-welding on the McBerty welder at the factory of The Warren Electric & Specialty Company in 1901?

A. Yes, sir.

Q. 3. At the time you did this welding, state whether or not the welder was mounted on a fiber block or slab of any kind?

A. No, sir. I don't remember of anything of that kind. As I remember it was mounted right on the bench.

(Mr. Pattison: That is all.)

(Mr. Stackpole: No cross-examination.)

Certificate and signature waived by consent of counsel.

EDWARD L. BETTEKER.

EDWARD L. BETTEKER, a witness called on behalf of the defendant, having been first duly sworn, testifies as follows in answer to questions by Mr. Pattison:

Direct examination by MR. PATTISON:

Question 1. What is your name and residence?

Answer. Edward I. Betteker, Warren Township.

Q. 2. What is your present occupation?

A. Farming.

Q. 3. Were you ever employed by The Warren Electric & Specialty Company?

A. Yes, sir.

Q. 4. What was your employment there?

A. Press work, and so on.

Q. 5. Were you familiar, during your employment by The Warren Electric & Specialty Company, with the manner of making their fan blades?

A. Well, I punched out the fan blades, I guess all that were made, that is, until they got more presses, then I supervised the work.

Q. 6. Out of what material were those fan blades made?

A. Brass, and cold-rolled sheet steel.

Q. 7. What was the color of this cold-rolled steel?

A. Well, it was bright steel, no scales, or anything like that on it.

Q. 8. Were you employed by The Warren Electric & Specialty Company at the time they sold out to The Peerless Electric Company?

A. Yes.

Q. 9. When did your employment begin with The Warren Electric & Specialty Company?

A. 1899, I believe, the day after Christmas, the 26th of December.

Q. 10. In what form did the material come to The Warren Electric & Specialty Company, the material out of which the fan blades were made?

A. Came in boxes, probably 10 or 12 feet long, in strips. Some of the strips, I believe, were 6 inches wide, for the 12-inch fan, and the other was perhaps 8 inches wide. It might have been less, but that was about the size of it.

Q. 11. State whether this material came through your department?

A. Yes. I got it from the stock room, to put through the press department.

Q. 12. Who did the press cutting of these fan blades during the years 1901 and 1902?

A. I probably did it myself at that time. I think it was about 1903 when we got more presses in there, and I didn't do so much press work myself then.

Q. 13. Did you do all the blade cutting up to 1903, when you got more presses?

A. Yes.

Q. 14. In cutting out these brass and steel blades, when the blank was first cut, was it with, or without rivet holes?

A. Without rivet holes.

Q. 15. Then the blank blade would have to have rivet holes punched through it?

A. Yes, in another operation.

Q. 16. Is it correct to say that you had one set of dies to punch out the blank blades, and another set to punch out the rivet holes?

A. Yes.

Q. 17. These two punching operations were separate operations?

A. Oh, yes.

Q. 18. Mr. Curtiss Brewer has testified in this case, that in 1901 The Warren Electric & Specialty Company bought its fan blades from an outside firm. Do you agree with that statement?

A. I never knew it, if they did.

Q. 19. In 1901, I understood you to say, that you cut out the blades that were used there?

A. I was there from 1899, and I cut them out until 1903. I did all the punch work. We only had one press, with the exception of a foot press. I think in 1903 we got more presses, and then I supervised the work.

Q. 20. And the blades were made out of this bright, cold-rolled steel?

A. Yes.

(Mr. Pattison: That is all.)

Cross-examination by MR. STACKPOLE:

X-Q. 1. Did you at that time punch the brass blades with the same dies as you punched the steel blades?

A. Yes.

X-Q. 2. The dies were the same?

A. Yes.

X-Q. 3. And the holes were punched with the same dies?

A. Yes. We had one set for punching holes, and one set for blanking—One set for the 16-inch fan, and one set for the 12-inch fan.

(Mr. Stackpole: That is all.)

Re-direct examination by MR. PATTISON:

Re-D. Q. 1. What kind of centers were used with the steel blades?

A. I think we punched that out of 14 gauge steel.

Re-D. Q. 2. How many rivets did that have?

A. Had 8 holes; two holes in an arm, and a hole in the center.

Re-D. Q. 3. Were there any fan blade centers, made by The Warren Electric & Specialty Company, that had different steel centers?

A. They were the same.

Re-D. Q. 4. How about the brass centers?

A. They were the same; unless the first ones we made had three holes, that was the only change. I am speaking about the two (2) hole blades.

Re-D. Q. 5. Then you had a different die for the spiders that had three (3) holes?

A. No. The spider that had three (3) holes was the one we used for the first two or three years; and then we changed over to an iron spider having eight (8) holes, two (2) in each arm, and one in the center.

Re-D. Q. 6. In the steel spider you had two (2) rivet holes?

A. Yes.

(Mr. Pattison: That is all.)

(Mr. Stackpole: That is all.)

Certificate and signature waived by consent of counsel.

(Mr. Pattison: Notice is hereby given that the record and briefs used in the Court of Appeals, in The Barney & Berry suit, will be handed to the Court, and referred to by defendant at the hearing.)

Adjourned to Findlay, Ohio, at the office of Messrs. Snyder & VanCampin, at 11 o'clock A.M., July 25, 1919.

IN THE DISTRICT COURT OF THE UNITED STATES

EASTERN DISTRICT OF MICHIGAN, SOUTHERN DIVISION

No. ———.

THOMSON SPOT WELDER COMPANY, Plaintiff,

vs.

FORD MOTOR COMPANY, Defendant.

Pursuant to agreement, counsel met at Findlay, Ohio, July 25, 1919.

Present: J. L. STACKPOLE, of counsel for plaintiff, and
A. S. PATTISON, counsel for defendant.

JASPER W. POWERS.

JASPER W. POWERS, a witness called on behalf of the defendant, having been duly sworn in this case, testified as follows:

Direct examination by Mr. PATTISON:

Question 1. Please state your name and residence.

Answer. Jasper W. Powers: Findlay, Ohio.

Q. 2. What is your present employment?

A. Superintendent of the Star Tractor Company.

Q. 3. Are you the Jasper W. Powers who testified in this case at Detroit before Judge Killitts?

A. I am.

Q. 4. At Detroit you testified about making parts of an electric welding machine, testified to by Mr. McBerty. I supposed you had been asked about all the work you did on that machine, but on examining the record I have failed to find that you testified whether you had any knowledge about the electrodes that were said to be used in that machine. Did you have any such knowledge?

A. I did.

Q. 5. What do you know about the making of electrodes for use in that machine?

A. Are you speaking of the blocks that—you mean the electrodes that were used in the spot welding?

Q. 6. Yes.

A. I made one or more pairs.

Q. 7. What was the shape of these electrodes?

A. They were round copper wire, what we would call hard-drawn copper wire.

Q. 8. How thick?—by Mr. Stackpole.

A. It was heavier than a quarter inch, and as I remember, it was about five-sixteenths.

Q. 9. How about the ends of these?

A. To describe that more fully, I will say it was larger than a fan guard rim or ring.

Q. 10. How about the shape of the ends of these electrodes?

A. They were slightly pointed, conical shaped.

Q. 11. When, as you remember, did you make these electrodes in reference to the time you did the work on the machine?

A. It was along about the same time; it was after the machine was in operation on butt welding.

Q. 12. You also testified to a conference between yourself and Mr. McBerty and Mr. Gillmer to determine whether the spot-welded blade should be adopted in place of riveted. State whether you did the work on these electrodes after or before this conference?

A. The work on the electrodes was before the conference.

Q. 13. Have you any reason for stating why these electrodes were made before the conference to which you refer?

A. At the time we did the spot welding, and considered using it as a manufacturing process for that season, or on that fan, I had a great many parts made up and all my fixtures were made for riveted blades. I don't know that I recall clearly anything else in connection with it except the early season, the early part of the season was when we were getting our parts out and I had those parts all made up, and argued in the conference against using the spot-welding.

Q. 14. You mean this argument occurred early in the season of 1901?

A. Yes.

Q. 15. And it was before this time that you made the electrodes to which you referred?

A. It was.

Cross-examination by Mr. STACKPOLE:

X-Q. 16. You remember making any bent electrodes?

A. I do not.

Signature and certificate waived by agreement of counsel.

DISTRICT COURT OF THE UNITED STATES

EASTERN DISTRICT OF MICHIGAN.

SOUTHERN DIVISION

Harmatta Patent No. 1,046,066.

In Equity, No. ———

THOMPSON SPOT WELDER COMPANY, *Plaintiff,*

vs.

FORD MOTOR COMPANY, *Defendant.*

Evidence taken on behalf of the defendant under the Revised Statutes of the United States and the Equity Rules of the Supreme Court of the United States, in accordance with stipulations heretofore entered into by counsel for the respective parties and pursuant to the annexed notice, before me, the undersigned Notary Public in and for the County of Wayne, State of Michigan.

EDWARD T. JEAN,
Notary Public.

(Seal)

My Commission expires March 31, 1923.

The parties met pursuant to the annexed notice at the office of Messrs. Barthel, Flanders & Barthel, 408-414 Buhl Block, 35 W. Congress Street, Detroit, Michigan, on the 24th day of July, 1919, at 10 o'clock A. M.

Present: Otto F. Barthel, of counsel for defendant.

William S. McDowell, of counsel for plaintiff, specially appearing for plaintiff for purpose of making objections to be hereafter stated.

It is stipulated that for convenience of counsel and the witnesses to be examined, the taking of testimony herein is adjourned to the office of O. J. Beaudette and Company, Pontiac, Michigan.

Parties met at the office of O. J. Beaudette and Co., Pontiac, Michigan. Present, as before, and the taking of testimony was commenced at 2.30 o'clock P. M., July 24th, 1919.

(William S. McDowell, associated with Stevenson, Carpenter, Butzel & Backus, attorneys for plaintiff, object to the taking of the testimony at this time for the reason that J. L. Stackpole of Boston, attorney in charge of this case for the plaintiff is this day engaged in the taking of the testimony in the same matter at the office of the Federal Electric Welding Company at Warren, Ohio, on the part of the plaintiff and that local counsel have not sufficient knowledge of the issues involved to properly conduct cross examination. Further, counsel for plaintiff objects that the taking of testimony at this time is improper, and should not be considered by reason of the fact that plaintiff's testimony is being taken simultaneously at Warren, Ohio, in said cause, and by reason thereof plaintiff cannot be represented at the hearing now about to be had. Counsel for plaintiff therefore moves that any testimony taken during the time that the testimony is being taken at another place in the same case should not be received as a part of the record in this case.)

(By Mr. Barthel: In view of the fact that it is my understanding that this case is set for trial July 31st, and as the time is drawing to a close in which to put in defendant's proof, it is necessary to take the testimony of these witnesses at this time, and the further fact that complainant has been represented in this cause by at least three or four different counsel who have conducted the examination of witnesses, it is not seen why it is particularly necessary that Mr. Stackpole should examine these witnesses.)

(Counsel for defendant gives notice on the record that in addition to the witnesses named he will examine:

Frank E. Mills, Assistant Manager of O. J. Beaudette and Co., Pontiac, Michigan.

M. L. Evelyn, Superintendent of O. J. Beaudette and Co., Pontiac Michigan.

A. W. Neeland, and J. G. Wright, both employes of O. J. Beaudette and Co., Pontiac, Michigan.)

A. W. NEELAND.

A. W. NEELAND, being duly sworn, deposes and says in answer to interrogatories propounded to him by Mr. O. F. Barthel, as follows, to wit:

Direct examination.

Question 1. What is your name, age, residence and occupation?

Answer. Andrew Winton Neeland; age 32; residence 262 South Paddock Avenue, Pontiac, Mich.; occupation, spot welder.

Q. 2. Where are you occupied as spot welder?

A. At the O. J. Beaudette Body Company, Pontiac Mich.

Q. 3. What kind of spot welding work do you do?

A. Most of it is on touring car rear seats; occasionally on other work—roadsters.

Q. 4. How long have you been engaged in this spot welding work?

A. Since October—1912.

Q. 5. How do you fix this date of October, 1912?

A. That is the time I first began welding; first welding I ever did, and I came here to do that work; promised to do that work when I came in. I had worked here previous to that time, but the shop shut down and I went to my old home, and every year they have a celebration on the Saturday nearest the 24th of August—and I came back directly after that, the Monday following, I came to the shop and they were not ready to start yet, so I went out on the farm and worked six weeks.

Q. 6. And was it immediately after that you started your work with the O. J. Beaudette and Company?

A. Yes—they sent for me while I was there.

Q. 7. For what car was this welding work done of which you speak?

A. For touring car.

Q. 8. Was that work which you did in October, 1912, for Ford touring cars?

A. Yes.

Q. 9. About how many of these per day were made when you started in October 1912?

A. We made about fifty per day for the first, probably ten days. Had some trouble getting fifty for the first day or two.

Q. 10. And about how many did you run your production up to within say the first thirty days?

A. Probably three hundred a day.

Q. 11. How were these spot welded?

A. Well, the seat was pressed in five pieces with a bead on each seat, and these beads were lapped over and the welds placed between two and three inches apart—along the bead.

Q. 12. How were these welds made?

A. The seat was placed back up on a post and welding was made by bringing the top die down on the work.

Q. 13. By post and die, do you mean contacts, or electrodes?

A. Yes.

Q. 14. About what time in October do you estimate that you started to work?

A. Probably the tenth; wouldn't be far from the tenth.

Q. 15. How were you paid for this work at this time?

A. Was paid by the day—for the first four or five weeks or maybe six weeks—don't just remember.

Q. 16. How were you paid after that?

A. By the piece.

Q. 17. What determined the change in rate of pay?

A. Production.

Q. 18. That is, when production got up to a certain amount, you changed from day work to piece work?

A. Yes.

Q. 19. The spot welders were set up in the shop ready for use when you came here?

A. One.

Q. 20. You have been working for O. J. Beaudette & Co from the time you started in October, 1912, up to the present time?

A. Nearly all the time. Last summer I was off for about four months. They were not putting out any touring cars then. They shut down about the middle of August and do not know just when they started touring cars again but they were running them again when I came back in the middle of December. You understand I worked for them before I began spot welding. The first work I did was in April, 1911—the summer of 1912 I was away.

Q. 21. And this is how you remember that you started to do spot welding in October, 1912—is that it?

A. You asked me if I had been here ever since 1912, and I said I had worked here before that.

Q. 22. But do you remember positively that you started to do spot welding on Ford bodies in October, 1912?

A. Yes, as I stated.

Cross-examination by Mr. McDOWELL:

(Having objected to the taking of this deposition, reserve whatever right of examination we may have to such further time as may be determined.)

Signature waived by consent of counsel.

J. G. WRIGHT.

J. G. WRIGHT, being duly sworn, deposes and says in answer to interrogatories propounded to him by Mr. BARTHEL, as follows, to wit:

Direct Examination.

Question 1. What is your name, age, residence and occupation?

Answer. James Gilbert Wright; age 45; residence 45 Henderson

Ave., Pontiac, Mich.; occupation spot welder, O. J. Beaudette & Co., Pontiac, Mich.

Q. 2. Where are you engaged as spot welder?

A. O. J. Beaudette & Co., Pontiac, Mich.

Q. 3. How long have you been in their employ?

A. Ten years—came the last of May, along about the 20th of the year 1909. Am not sure about the exact day.

Q. 4. How long have you been doing spot welding?

A. Since October, 1912.

Q. 5. What kind of spot welding work was this that you did in 1912?

A. Ford touring car. Rear seats; also some town car tops.

Q. 6. How did you happen to be doing this work at the plant of O. J. Beaudette & Co., Pontiac, Mich., at this time?

A. I had been here for two years, or something like that. Had been on the beader, and we made seats all in one piece, and then a change was made and they were pressed out into five pieces. Thru the summer I had been in New York State until the latter part of June. There were five or six of us making up bending strips all summer. I was one of the oldest men in the metal room, so when they got spot welders they did away with the order job and so I was changed immediately to the spot welding job.

Q. 7. How long before October, 1912, did you see these spot welders at the plant of O. J. Beaudette & Co., Pontiac, Mich.

A. I cannot say. I remember when the first one was there. It stood by the door quite a little while, then they moved it down near where the water fountain is now, and it stayed there, and then it was set up and used for welding town car tops. Then I think Mr. Buffington was there for a week or two welding town car tops, and then when they got the presses in shape, Mr. Neeland came in, and they put us on spot welding. This was sometime in October.

Q. 8. And have you been doing spot welding work ever since on Ford car bodies and tops?

A. Yes. Except sixteen days last summer.

Q. 9. Were these bodies the regulation Ford commercial automobile bodies?

A. They were.

Q. 10. That is, the touring car bodies?

A. Yes—and roadster bodies also.

Q. 11. About how many of these per day were gotten out by you and Mr. Neeland during October, 1912?

A. Well, that is pretty hard to say. We started in somewhere about fifty (50) and of course increased as fast as we could. It was right around Fall, just before election, that Mr. MacGuire sent me after a gentleman by the name of Mr. Viola who is working here at the present time, and it was just about two weeks after he came that we started on two machines, and we had had one machine in operation I should say nearly a month.

Q. 12. How many a day did you get out when they got the second machine?

A. Right around 300.

Q. 13. How were these bodies spot welded?

A. Well, the body came to us in five pieces with a two piece overlap and the welds were spotted about two and one-half to three inches.

Q. 14. How did the electrodes contact with the over-lapped beads?

A. There was a pointed die on the bottom which is stationary and the top die is flat, about one and one-half inches in diameter, and we worked the top die by hand-lever—on one machine we used the hand lever and on one the foot tread.

Q. 15. When these dies came together, what did they do?

A. Most generally weld.

Q. 16. Is this what you call spot welding?

A. Yes.

Q. 17. Do I understand these welding spots are spaced apart along the bead?

A. Yes, spaced along the bead; from two to three inches.

Q. 18. For whom were these automobile bodies made?

A. For whom were the made?

Q. 19. Yes—by the O. J. Beaudette Co. of Pontiac, Mich.?

A. Ford Motor Company.

Q. 20. And have you been making automobile bodies for the Ford Motor Co. ever since?

A. Yes—I have been, excepting sixteen days I worked over to the General Motor Co. last fall.

Q. 21. Are you quite positive that you did spot welding work on Ford Automobile bodies in October, 1912?

A. I am.

Q. 22. And were these the regular standard product for the Ford Motor Co.?

A. They were.

Cross-examination by Mr. McDOWELL:

(Having objected to the taking of testimony at this time, reserve right to cross-examine witness as to matters testified to in said examination until such further time as may be determined.)

Signature waived by consent of counsel.

FRANK E. MILLS.

FRANK E. MILLS, being duly sworn, deposes and says in answer to interrogatories propounded to him by Mr. O. F. BARTHEL, as follows, to wit:

Direct Examination.

Question 1. What is your name, age, residence and occupation?

Answer. Frank E. Mills; age 38; residence 228 Orchard Lake Ave., Pontiac, Mich.; occupation Assistant Manager, O. J. Beaquette & Co., Pontiac, Michigan.

Q. 2. How long have you been engaged with said company?

A. Since 1901.

Q. 3. What product does said Company make?

A. Automobile bodies.

Q. 4. For what companies?

A. At the present time, only the Ford Motor Co.

Q. 5. How long have you been making bodies for the Ford Motor Co.?

A. Since 1907.

Q. 6. Have you missed any years since that time?

A. None.

Q. 7. What is your work in connection with the making of these bodies?

A. I have always figured and estimated the cost of the bodies.

Q. 8. And in connection with the estimating of costs, for bodies, are you furnished with any data from which to make these estimates?

A. Yes.

Q. 9. I hand you herewith a blue print and would ask you if you have ever seen this print or a copy thereof in connection with any of your estimating work?

A. Yes, this is the construction of body I remember well.

Q. 10. For what model car was this body, if you recollect?

A. 1913 Model.

Q. 11. How is it that you remember this body well?

A. I recollect a few weak points that developed after we started to get and after we got same out.

Q. 12. About when was this body submitted to you for estimating?

A. In the summer of 1912.

Q. 13. I notice this drawing is dated June 21st, 1912. Would you say that it was shortly after this time?

A. Shortly after this time, I should say it was.

Q. 14. Is there anything else which enables you to remember this particular type of body well?

A. Yes, that is the first body we ever did any spot welding on.

Q. 15. Does this drawing show that?

A. It shows it here and here and here and here—(witness points to heads on drawing or blue-print—marked "X" in pencil).

(Counsel for defendant requests that the blue print referred to by the witness be marked for purposes of identification "Blue Print Ford Touring Car—Spot Welded Body.")

Q. 15. You state that this body was for the 1913 model? Now, do you know when the season begins?

A. For the different models?

Q. 17. For the different models? Each year?

A. It is supposed to begin August first.

Q. 18. What year?

A. For the preceding year—that is when it is supposed to begin.

Q. 19. That would be August 1st, 1912?

A. August 1st, 1912, yes.

Q. 20. So that in the summer of 1912 you began to get ready for the 1913 model, is that correct?

A. Yes.

Q. 21. About when were the spot welders secured for this job?

A. Between July and November or December of 1912.

Q. 22. And about what time did you begin getting up material for these jobs?

A. About in August or September—probably.

Q. 23. I hand you herewith memorandum sheet dated August 31, 1912, and would ask you what this is?

A. This is a list of metal that we used on the 1913 touring car for the Ford Motor Company.

Q. 24. Does that show the particular parts of the job which were cut up and spot welded?

A. Yes.

Q. 25. Will you mark them with pencil?

(Witness does so, marking same with the letter 'X'.)

Q. 26. Is this one of the original lists of your company?

A. Yes.

(Counsel for defendant offers in evidence list referred to by witness and instructs Notary to mark same "Defendants Exhibit Metal List for 1913 Touring Car.")

Q. 27. About when did you go into production on these spot welded bodies?

A. In October, 1912.

Q. 28. And did you see some of these bodies welded at that time?

A. I did.

Q. 29. How were they welded?

A. Spot welded.

Q. 30. At what points?

A. Along the bead from two to three inches—the full length of the bead.

Q. 31. By bead what do you mean?

A. That is the pressed-out part—half oval shape.

Q. 32. And do these parts overlap each other?

A. The beads overlap each other, welded on the piece.

Q. 33. And these bodies were regular standard production of the Ford Motor Company at that time, were they?

A. They were.

Q. 34. Have you any record which would show when this spot welding work was done?

A. Yes.

Q. 35. Will you produce it?

A. Yes—the Superintendent's book.

Q. 36. Is he here in the shop?

A. He is—yes.

Q. 37. Have you looked up to find the records of the Company in reference to this Ford body work?

A. Tried hard to look them up.

Q. 38. And did you succeed in finding the records?

A. No.

Q. 39. What became of them?

A. They were destroyed in the Spring of 1917.

Q. 40. How did it happen that they were destroyed?

A. They were placed in a vault at the east end of the factory where our office formerly was and during a heavy rain, or thaw, in the Spring of 1917 they were destroyed thru water getting into the vault—destroying all papers that were in there.

Cross-examination by Mr. McDOWELL:

(Having objected to the taking to the testimony at this time, reserve right to cross-examine as to matters testified to in said examination until such further time as may be determined.)

Signature waived by consent of counsel.

M. L. EVELY.

M. L. EVELY, being duly sworn, deposes and says in answer to interrogatories propounded to him by Mr. O. F. BARTHEL, as follows, to wit:

Direct examination:

Question 1. What is your name, age, residence and occupation?

Answer. M. L. Evely; age 48; residence Pontiac, Mich.; occupation Superintendent, O. J. Beaudette & Co., Pontiac, Mich.

Q. 2. How long have you been connected with the O. J. Beaudette Co.?

A. Nine years.

Q. 3. And what do they manufacture?

A. Automobile bodies.

Q. 4. During the nine years that you have been connected with them, what automobile bodies have been manufactured by them, principally?

A. Ford's, principally.

Q. 5. And how were these bodies assembled so far as relates to the subject-matter in the suit?

A. Just what do you mean by that?

Q. 6. I mean in reference to the uniting of the parts of the sheet metal body?

A. You mean by spot welding, riveting, etc., like that? The way they are united is by spot welding and riveting.

Q. 7. Why do you rivet in places?

A. Riveting is in places where you do assembling; where you could not handle spot welding.

Q. 8. When did you first make bodies which involved spot welding?

A. According to my private records I started in October, the 26th of October, 1912.

Q. 9. You started to make what?

A. Bodies that were spot welded together.

Q. 10. Were they standard Ford automobile bodies?

A. Yes, they were.

Q. 11. Were they manufactured for the trade?

A. They were.

Q. 12. About how long prior to this time did you rig up for the manufacture of these bodies?

A. Oh, well, I could not say definitely but it took us probably about three months. It takes quite a long while to get our dies out.

Q. 13. From October 26, 1912, and prior to December 3, 1912, how many Ford automobile bodies did your plant turn out in regular production that included these spot welding features?

A. 3,345.

Q. 14. And these were made for the Ford Motor Company?

A. For the Ford Motor Company.

Q. 15. Where was this spot welding on these bodies?

A. On the corners of the rear seat.

Q. 16. How was this spot welding done?

A. Well, to unite the five pieces comprising this assembly into an assembly. I can name the pieces if you wish it—the way we term them.

Q. 17. Were the pieces overlapped?

A. They were.

Q. 18. And were they beaded along this overlapped portion?

A. They were.

Q. 19. And how were they spot welded on this overlapped beaded portion?

A. In the center of the bead.

Q. 20. How were these spot welds placed?

A. Distance apart—about two and one-half to three inches apart.

Q. 21. Will you explain just how the operator would make one of these welds?

A. First of all we take the seat quarter and the corner panel,

both of these have a bead on the edge; one is placed on top of the other one, and spot welded. The bead locates the two pieces in its proper place. Then we move that along on the spot welder from bottom to the top of the seat at intervals of two and one-half to three inches apart.

Q. 22. At these intervals of two and one-half to three inches apart, what takes place?

A. Welds.

Q. 23. How are these welds made?

A. By electricity.

Q. 24. Will you explain how this is done?

A. The contacts are made by two copper points and the work is placed between these two points, and when you trip the machine it throws the current on, the iron being of a nature that will weld. This is really all there is to a weld.

Q. 25. By iron I take it you refer to the sheet metal, do you not?

A. Yes.

Q. 26. I understand that your company records have been lost in a flood which you had some years ago. Is that right?

A. I believe it is, when we moved from the other office up here a lot of our records were lost, and I could not just say what they were, but I know we lost a lot—a great many of our records.

Cross-examination by MR. McDOWELL:

(Having objected to the taking of testimony at this time, reserve right to cross-examine witness as to matters testified to in said examination until such further time as may be determined.)

Signature waived by consent of counsel.

Adjourned at 5.00 o'clock P.M., to the Office of the Ford Motor Co., Highland Park, Michigan.

Parties met at the Offices of the Ford Motor Company, Highland Park, Michigan, present as before, and the taking of testimony was resumed at 11.30 o'clock A.M., July 25, 1919.

Counsel for defendant gives notice that he will take the testimony of Hubert E. Hartman, Legal Department, Ford Motor Company, in addition to the witnesses before named.

Counsel for defendant offers in evidence copy of decision of Board of Examiners-in-Chief dated June 24, 1919, in Re. Appeal 2844, S. Z. de Ferranti versus Johann Harmatta for improvements in electric welding.

JOHN J. FINDLATER.

JOHN J. FINDLATER, being duly sworn, deposes and says in answer to interrogatories propounded to him by MR. O. F. BARTHEL, as follows, to wit:

Direct examination:

Question 1. What is your name, age, residence and occupation?

Answer. John J. Findlater; age 36; residence 101 Tuxedo Ave., Highland Park, Mich.; occupation Assistant Superintendent, Ford Motor Co., Detroit, Mich.

Q. 2. How long have you been employed by the Ford Motor Co.?

A. I have been at this plant since May, 1913. Before that in the Ford Motor Co. Pressed Steel plant in Buffalo that was acquired in June, 1911.

Q. 3. And prior to that time where were you employed?

A. In the same plant that was known as the John R. Keims Mills, Inc., Buffalo, N. Y., since 1903.

Q. 4. What were your duties at the John R. Keims Mills, Inc., Buffalo, N. Y.?

A. When I started there I was employed as a tool and die maker. Afterwards I had charge of the Press Dept. and of the Tool Room, as Tool Foreman. Later on I was General Foreman of the entire plant.

Q. 5. Prior to the John R. Keims Mills, Inc., of Buffalo, N. Y., being taken over by the Ford Motor Co., did you do any work for the Ford Motor Co.

A. Almost exclusively.

Q. 6. What class of work was that?

A. Transmission cases, rear axle housings, gasoline tanks, fenders, running board shields, steering columns; in fact practically all of the pressed steel parts or the sheet metal parts.

Q. 7. And was this plant known as the Pressed Steel Plant after it was taken over by the Ford Motor Co.?

A. Yes—by the letterheads and the stationery it was known as the Ford Motor Co., Pressed Steel Plant.

Q. 8. After this plant was taken over by the Ford Motor Co. in June, 1911—did you see any other work done there?

A. Yes—they made a steel body.

Q. 9. How was this body made?

A. It was made entirely of steel, no wood was used in it. In taking place of the wood, there were steel sections along the bridge members, channel irons with reinforced holes in them all the way along. I was connected with that in the way of making tools to stamp out these different parts.

Q. 10. How were some of these parts united?

A. They were spot welded together; some riveted; some soldered.

Q. 11. Who worked with you in connection with the building of this body?

A. The body was built under the supervision of Wm. H. Smith and Knudson—these two men had charge of it—that is, they spent their personal time on it considerably.

Q. 12. What kind of machines were used that did the spot welding on this body in question?

A. We had a Winfield Spot Welder.

Q. 13. About when was this spot welder put in the plant?

A. I could not recall the exact date when it was put in.

Q. 14. Did you do some work on this spot welder?

A. I did some work on it myself, personally, in connection with fastening the flange on to the tube on the steering column.

Q. 15. And that was done by means of spot welds?

A. Yes.

Q. 16. About when was this spot welding work done?

A. The welding I did was from eight months to a year before I came here.

Q. 17. And you came here?

A. I came here in May, 1913.

Q. 18. In May, 1913?

A. Yes.

Q. 19. Do you know for what season or model this all-steel body to which you have referred was built?

A. The 1912 body.

Q. 20. Do you know what became of the welder that was used in the making of this body?

A. It was shipped to this plant here.

Q. 21. Did you afterwards see that welder in this plant?

A. Yes.

Q. 22. And is that welder still in use here?

A. I believe it is. I might say here I am familiar with that welder. I can recognize and identify it because it is of a different type than the welders we use right now. It looks different than the other ones. I have used it since I have been here.

Q. 23. And you have used it for spot welding?

A. Yes.

Cross-examination by Mr. McDOWELL:

(Having objected for the reason that Mr. Stackpole, counsel in charge of case for the plaintiff, is not present, by reason of the fact that he is engaged elsewhere in taking depositions in same cause, reserve right to cross-examine for future time if the Court shall determine this evidence proper.)

Signature waived by consent of counsel.

HARRY P. PROSSER.

HARRY P. PROSSER, being duly sworn, deposes and says in answer to interrogatories propounded to him by MR. O. F. BARTHEL, as follows, to wit:

Direct Examination:

Question 1. What is your name, age, residence and occupation?

Answer. Harry P. Prosser; age 37; residence Pontiac, Mich., R. F. D. No. 6; occupation General Branch Assembly Work, Ford Motor Company, Highland Park, Mich.

Q. 2. I take it you have charge of the assembling of the parts which go into the cars for the branches, is that it?

A. I look after trouble work and general branch assembly conditions.

Q. 3. How long have you been connected with the Ford Motor Co.?

A. Since March 5, 1907.

Q. 4. What were your duties in connection with your earlier services with the company?

A. Draftsman in the Drafting Room.

Q. 5. And after that?

A. Along about 1911, I think it was, I was placed on the body work. My duties were to see that the body companies were kept in touch with information relating to drafting pertaining to bodies, and also trimming.

Q. 6. And did you have occasion to see this work in process of construction?

A. Yes, it was my duty to visit all body companies.

Q. 7. In your visit to these various plants, what, if anything, did you see which might have bearing in connection with this case?

A. They had spot welders that were used for our back panels by which I mean they used these machines for spot welding beads together.

Q. 8. What places did you have occasion to visit?

A. O. J. Beaudette Body Co., Pontiac, Mich., Wilson Body Co., Detroit, Mich., Kelsey-Herbert Body Co., Detroit, Mich. (now known as the Kelsey Wheel Co.), and the Fisher Body Corporation, Detroit, Mich.

Q. 9. Did all these concerns build bodies for the Ford Motor Co.?

A. Yes, sir.

Q. 10. On any of your visits to the Beaudette Body Co. of Pontiac, Mich., what, if anything, did you see that might have bearing on this case?

A. I noticed the operation of spot welding these panels, which was exceedingly interesting due to the fact that they had plans for this design of job; about the only way they could do them.

Q. 11. How was that work done?

A. The panels were laid together with overlapping bead held by two men who placed them in that condition in the machine, and then a man with his foot would bring down one lever at the contact point and immediately the top point would fall on top of the metal panels which would allow, I presume, the current to pass through the metal, fusing the beads together. That would be the contact point underneath the beads and the upper contact point of the machine brought down on top of the metal beads caused the current to flow through and fuse the metal altogether.

Q. 12. Were these beads fused together throughout their entire length, or at the points where the contacts came together?

A. Where the contacts would come together, I think we specified something like two and one-half to three inches apart where the contacts would come.

Q. 13. About when was it that you saw this work at the Beaudette Plant?

A. Our drawings were turned over to Beaudette in the summer of 1912, and it was my duty to follow the work from that time on. I first noticed the spot welding operation along in the fall, in October, I believe, more particularly because my attention was called to the fact that they were having difficulties with their work, and I was out in the factory considerably and noticed conditions and that is how I noted the spot welding work.

Q. 14. But you did go into the quantity production basis on these bodies?

A. Well, the production end I did not have so much to do with. The quantity turned out was not very great until along the latter part of the month of October.

Q. 15. Where was this idea of spot welding these panels together along the beading developed?

A. Why, along back in the early part of 1911, before I went out to the body works, Mr. Wills had a Mr. Kratz working on an all-metal body, similar in shape according to this drawing, and the only way that they could work this out was by using the method of welding the panels together, because the design was carried out similar to this design here. (Witness referring to blue-print already offered for identification.)

Q. 16. Was there anything furnished the O. J. Beaudette Body Co. from which to make the bodies of which you have been testifying?

A. They had a print similar to this one here. (Witness referring to blue-print already offered for identification.) I think Mr. Wills and the O. J. Beaudette Body Co. were in consultation previous to receiving the print.

Q. 17. I hand you herewith print to which you have just referred and would ask you if that shows the type of body to which you have referred?

A. Yes, sir. It shows the shape of the beadings; one overlapping the other.

Q. 18. Is there anything particular about this body which enables you to fix the year as 1912?

A. Our dates are on there at time drawing was submitted.

Q. 19. What date do you find thereon?

A. Shows date on here of June 21, 1912.

Q. 20. And do you find any reference thereon in reference to spot welding?

A. There is a note on here which says "to be spot welded not over

two inches in length on moulding." That word "moulding" is sometimes used in place of beading.

Q. 21. And has this inscription in reference to spot welding been on this drawing ever since the date which it bears, June 21, 1912?

A. I think it has, yes, sir.

Q. 22. Did you have anything to do with the making or development of this drawing or type of body?

A. Yes, sir, it was my duty from time to time to see that drawings were brought up to date on changes which were considered necessary, and each time the date was put on and what the change happened to be.

Q. 23. But no change has been made affecting the spot welding on the moulding or bead, is that right?

A. No, sir, no change has been made.

Q. 24. Do you know about when the Kelsey-Herbert Co. started production on that same type of body?

A. It was about the time Beaudette started their production. I think it was along in November.

Q. 25. And you saw spot welding bodies also made at this plant?

A. Yes, sir.

Q. 26. All of these bodies were used in the regular production of the Ford Motor Co.?

A. Yes, sir.

Q. 27. Where did you get this drawing or blue-print about which you have been testifying?

A. This print was made from drawing which we have in drafting room at the present time. An ink tracing.

Q. 28. And that drawing is being kept for reference in the drafting room?

A. Yes, sir.

Q. 29. So that it would not be convenient to have that drawing go out of your possession?

A. I hardly believe they would let me take it out of there. The print is an exact duplicate of the drawing.

(Counsel for defendant offers in evidence the blue-print or drawing referred to by witness marked "Defendant's Exhibit Touring Car Body T 5403-1913" the blue-print being substituted for the original drawing with the understanding that the original will be produced at any time for purposes of inspection and comparison.)

Q. 30. I notice that this drawing bears a 1913 date within the circle containing the letter T-5403—to what does that refer?

A. That refers to the 1913 design. Our fiscal year production started in August and this body was designed and brought forward so that they could produce it for our 1913 work.

Q. 31. What time in August does your fiscal year start?

A. I don't know at just what date but it's along about July 31st or the first of August.

Q. 32. And this is of the year previous so that the fiscal year would start in August, 1912, for the 1913 season, is that correct?

A. Yes—that's the idea.

Q. 33. Those bodies made by the O. J. Beaudette Co. and the Kelsey-Herbert Co. were regular standard output of the Ford Motor Co., were they not?

A. Yes—regular output.

Q. 34. And they were made for your company as regular production and under your supervision?

A. Yes, sir.

Q. 35. And the quantity production commenced in October, 1912?

A. Along about October, 1912—yes, sir.

Q. 36. And these concerns rigged up for their manufacture some months prior to October, 1912?

A. Yes, they commenced to get ready, as soon as their contracts were given.

Cross-examination by MR. McDOWELL:

(Having objected for the reason that Mr. Stackpole, counsel in charge of case for the plaintiff, is not present, by reason of the fact that he is engaged elsewhere in taking depositions in same cause, reserve right to cross-examine for future time if the Court shall determine this evidence proper.)

Signature waived by consent of counsel.

Adjourned at 12.30 o'clock P. M.

Resumed 1.30 o'clock P.M.

HUBERT E. HARTMAN.

HUBERT E. HARTMAN, being duly sworn, deposes and says in answer to interrogatories propounded to him by MR. O. F. BARTHEL, as follows, to wit:

Direct examination:

Question 1. What is your name, age, residence and occupation?

Answer. Hubert E. Hartman; age 34; residence 345 Elmhurst Ave., Highland Park, Mich.; occupation Chief Attorney for the Ford Motor Co., Highland Park, Mich.

Q. 2. You have charge of the Legal Department of the Ford Motor Co.?

A. Yes, sir.

Q. 3. I hand you herewith revised list of the contributors of the Welding Patents Investigating Committee and notice the name of the Ford Motor Company thereon as one of the contributors, and would ask you what you have to say to this?

A. The Ford Motor Co. contributed in a limited sort of a way to this Investigating Committee Fund for the purpose of investigating the merits of a patent, determining what our action should be with reference to recognition of a patent. We contributed twice, I think, under a special arrangement whereby we reserve at all times a separate and independent action and without prejudice to any action we might wish to take independent of the Committee. Contributions were also made upon the understanding that we did not thereby become bound by any obligations to assist in the defense of any action brought against any member of the Committee or contributing party to the fund, reserving at all times the right to decide for ourselves if action should be brought against us whether or not we would avail ourselves of the evidence gathered by the Committee or ask them for assistance in defending the case. When suit was brought against us, after a conference with Mr. Henry Ford, Mr. Alfred Lucking of counsel for this company, it was decided that in accordance with the continued policy of this company, we would defend the case ourselves independent of the Welding Patents Committee. We therefore arranged with our attorneys for our own defense and have so conducted it since.

Q. 3. Have you paid all the bills in connection with the conduct of the defense?

A. We have paid all bills we have any knowledge of. Many thousands of dollars have been paid by us during the progress of the suit to our own attorneys and for expenses and the taking of their testimony.

Q. 4. The original contributions to the Welding Patents Investigating Committee, I take it then, were merely for the purpose of investigating the prior art?

A. Yes, that would be the way I would put it. I might also say that Mr. Ford instructed us personally never to become bound by an agreement in defense of this suit with any other parties who might be interested in it. And it has also been his policy to fight his own patent battles.

Q. 5. I take it, then, that you reserved the right of independent action?

A. Yes.

Q. 6. Do you know whether the moneys contributed for investigation purposes by your company were kept in a separate account?

A. We asked that they be so kept and received a letter from Mr. Milligan (I think it was), Chairman of the Committee stating he was keeping our contributions separate from that of the other contributors, in accordance with our request.

Q. 7. Am I to understand that your company has paid all of the expenses so far incurred in connection with the suit in which you are now testifying?

A. I can say we paid all expenses which we have been called upon to pay; which were represented by attorneys' fees of our attorneys, Barthel-Flanders and Barthel, together with the other counsel he has had assist him and all expenses of preparation of the defense.

Q. 8. No moneys have been received by you or other contributions from the contributors included in the revised list of contributors dated July 17, 1917?

A. No.

Q. 9. Did your company agree to contribute to the defense of any member of the Committee that might be sued under the Har-matta Patent?

A. No, sir.

Q. 10. As the head of the Legal Department, the defense of this suit has been under your control, exclusively.

A. Yes, sir.

Q. 11. Was there ever any permission given to use your name in connection with the list of contributors?

A. No, sir.

(Counsel for defendant offers in evidence revised list of contributors to Welding Patents Investigating Committee, and instructs Notary to mark same, "Defendant's Exhibit Bulletin No. 21—July 17, 1917.")

Q. 12. Has the conduct of this case been influenced in any way by any action which the Welding Patents Committee may have taken?

A. No.

Cross-examination by Mr. McDOWELL:

(Having objected for the reason that Mr. Stackpole, counsel in charge of case for the plaintiff, is not present, by reason of the fact that he is engaged elsewhere in taking depositions in same cause, reserve right to cross-examine for future time if the Court shall determine this evidence proper.)

Signature waived by consent of counsel.

A. M. WIBEL.

A. M. WIBEL, being duly sworn, deposes and says, in answer to interrogatories propounded to him by Mr. O. F. BARTHEL, as follows, to wit:

Question 1. What is your name, age, residence and occupation?

Answer. A. M. Wibel; age 33; residence 142 Collingwood Ave.,

Detroit, Mich.; occupation Mechanical Engineer, Ford Motor Co Highland Park, Mich.

Q. 2. With what company are you connected as Mechanical Engineer?

A. Ford Motor Company, Highland Park, Mich.

Q. 3. How long have you been connected with them?

A. Seven years—since May 3, 1912.

Q. 4. What are your duties with the Ford Motor Co. in your capacity as mechanical engineer?

A. Specification of all machinery equipment; purchasing same; lay-out of machine operations and other relating work.

Q. 5. In the purchase of machine equipment, do you have occasion to purchase spot welding machinery?

A. Yes, sir.

Q. 6. When did you on behalf of your company make the first purchase of this class of spot welding machinery for the Detroit plant?

A. According to my records this purchase was made the 20th of August, 1912. Received in our plant 19th of September, 1912.

Q. 7. For what kind of a machine was this purchase?

A. This particular purchase was made for a Winfield Spot Welding machine—S-6-M-Electric Spot Welder—Winfield Serial No. 2157.

Q. 8. And about how soon after this machinery was received in September, 1912, was it put into operation?

A. In ordinary practice, after machinery is received in this plant it is put in operation about five days. This time may vary according to the type of machinery, and the amount of work necessary to set it up and put it in operation.

Q. 9. But ordinarily you are behind in machinery equipment so that its installation is urgent?

A. With very few exceptions, equipment is so urgently needed immediately upon its receipt in the shop it is put in operation at the quickest possible time.

Q. 10. Prior to the purchase of this machinery which I understand was the first spot welding purchased for use at the Detroit plant, had your company purchased any other machines?

A. Of this particular kind?

Q. 11. Any other spot welding machines?

A. Not to my knowledge. I believe this spot welder is the first we have ever purchased for use in this particular plant, through the engineering department. Our records show this to be the first machine.

Q. 12. When the John R. Keim Mills, Buffalo, N. Y., was taken over by your company, were there any spot welding machines purchased from them?

A. There was one spot welding machine in the possession of the John R. Keim Mills, but the records would show whether that was in our possession at that particular time or whether it had been pur-

chased through them and used by us. I refer to Winfield Spot Welder—their serial number 318. Our records show that this particular welder was purchased in Buffalo to be used for our body pressed steel work, same as was being done by the John R. Keim Mills.

Q. 13. Can you give the year?

A. This was along in July or August, 1912, to my knowledge and from the records the machinery had evidently been used some time before that. The records show this particular machine was purchased in 1911, through the John R. Keim Mills of Buffalo, N. Y.

Cross-examination by Mr. McDOWELL:

(Having objected for the reason that Mr. Stackpole, counsel in charge of case for the plaintiff, is not present, by reason of the fact that he is engaged elsewhere in taking depositions in same cause reserve right to cross-examine for future time if the Court shall determine this evidence proper.)

Signature waived by consent of counsel.

Adjourned from Friday, July 25, to Monday, July 28, 1919, at 3.00 P.M. o'clock.

WILLIAM H. SMITH.

WILLIAM H. SMITH, being duly sworn, deposes and says, in answer to interrogatories propounded to him by Mr. O. F. BARTHEL, as follows, to wit:

Question 1. What is your name, age, residence and occupation?

Answer. William H. Smith; age 48; residence Detroit, Mich.; occupation Engineer, Ford Motor Co., Detroit, Mich.

Q. 2. How long have you been connected with the Ford Motor Co.?

A. Directly since 1912—associated with them in their work since 1905.

Q. 3. What do you mean by directly associated with the Ford Motor Co. since 1912?

A. I became a part of the organization of the Ford Motor Co. in 1912 when they bought the plant I was with at that time.

Q. 4. What plant was it that they bought?

A. John R. Keim Mills, Inc., Buffalo, N. Y.

Q. 5. How long were you associated with them?

A. I was one of the organizers of the company, which was in the year 1900.

Q. 6. What was your official capacity with that company?

A. General Manager.

Q. 7. And that company was afterwards taken over by the Ford Motor Company?

A. It was, yes.

Q. 8. When was this?

A. Fifty per cent of the stock was taken over pro-rata by the stockholders of the Ford Motor Co. in 1911 and one hundred per cent of the stock of the company was taken over by the Ford Motor Company in the early part of 1912.

Q. 9. When this plant was taken over by the Ford Motor Co., was it continued to be called the John R. Keim Mills, Buffalo, N. Y.?

A. No, it was called the Ford Motor Co. Pressed Steel Plant.

Q. 10. It was known as the Pressed Steel Plant, is that right?

A. Yes.

Q. 11. What class of work was done at this plant?

A. Making of sheet metal, sheet steel frames and parts for automobile construction.

Q. 12. Did you do any work there which might have any bearing on the matter here in controversy?

A. What is the matter in controversy?

Q. 13. Spot welding?

A. We built and developed the first steel body that was made for the Ford car at that plant in 1911, that was spot welded.

Q. 14. In what way was this body spot welded?

A. Where the sheet parts joined each other—where they attached to the frames composing the body.

Q. 15. With what kind of a machine was this spot welding work done?

A. With a machine we purchased from the Winfield Co. at Warren, Ohio. At the two contact points, the current was turned on when the lever was brought down by a pressing action.

Q. 16. And how were the metal sheets placed in the machine for welding?

A. The two sheets were held in the machine by hand; this was a developing job at that time and not a production job.

Q. 17. Was the Winfield machine to which you refer one of those put out by the Winfield Electric Welding Co. of Warren, Ohio?

A. Yes, it was from the Winfield Electric Welding Co. of Warren, Ohio.

Q. 18. And about when was this purchased?

A. The date on the order was about March, 1911. The order was placed along about February and we got our machine in March or April.

Q. 19. And was it put to use as soon as received?

A. Yes—we were waiting for it.

Q. 20. What was it that gave you the idea of spot welding these bodies, if anything?

A. The idea of spot welding bodies was original with us. We

had made bicycle hardware and were acquainted with the welding process. When we started to design bodies we called in some builders of welding machines and told them what we wanted. Winfield visited the plant on our request for him there and he told us he was making a machine that was for spot welding and could be assigned to our purpose, with some little alterations.

Q. 21. I take it you refer to Mr. Winfield of the Winfield Electric Welding Company of Warren, Ohio?

A. Yes.

Q. 22. How were the welding spots located on this body?

A. They would be close to the edge where the two metals came together probably an eighth of an inch from the edge and then the spots go along at intervals of one and one-half to two inches according to what strength was required.

Q. 23. That is along the line where the adjacent edges of the sheet metal body overlap?

A. Yes. At that time, understand, the bodies were not made in a single piece. There were two seats to a body proper—the seats were detachable.

Q. 24. And the spot welding work was done in connection with this type of body?

A. It was.

Q. 25. Do you remember for what year or model this body was made?

A. This work was done on the original design of job that existed in 1910 and 1911 and that body was finished and sent here and the work was held pending new design for 1912, and that is why we did not continue with it.

Q. 26. When the new design of 1912 came out, did you take up with any companies the matter of making these bodies?

A. Making the new design?

Q. 27. Yes.

A. The new design I took up with the Fisher and Beaudette Companies personally and explained our method of construction.

Q. 28. Was the spot welding used in connection with these bodies?

A. It was, yes.

Q. 29. And so far as you know, they purchased welding machines for this work?

A. Yes, I think the same kind of a welding machine was purchased—from the same design we used—the Winfield—in the case of Beaudette.

Q. 30. When did you leave the Buffalo plant and come to the Highland Park plant of the Ford Motor Co.?

A. In July, 1912.

Q. 31. And was all this work done prior to your coming to Detroit?

A. The developing of the body and making of the body and welding in Buffalo was done prior to my coming here.

Q. 32. So that you are quite positive that the spot welding work

had been carried out in Buffalo prior to your coming to Detroit in July, 1912?

A. Very positive—I directed it; carried it out.

Q. 33. Do you know John J. Findlater?

A. I do.

Q. 34. Where did you become acquainted with him?

A. He was one of the foremen in the John R. Keim Mills at Buffalo, N. Y.

Q. 35. Did he have anything to do with this work so far as these spot welding machines were concerned?

A. I don't recall now that he had anything to do other than what a tool maker would have to do in building parts. He was acquainted with the machine being there, but I don't believe he had anything to do with the operating of it.

Q. 36. He had something to do with the building of the tools for the machine?

A. Yes, building tools and the tools used in making body parts, but not operating of the machine—that was under the experimental division.

Q. 37. By tools I take it you include dies for the body as well, do you not?

A. There were no dies made for this body. The pieces were cut out and fitted in. What I mean by tools are fixtures and points that would go on the welding machine.

Q. 38. He had to do with the keeping of that machine in running order?

A. He was one of the men that responsibility would come under.

Cross-examination by Mr. McDowell:

(Having objected to the taking of testimony at this time, reserve the right to cross-examine witness as to matters testified to in said examination until such further time as may be determined.)

Signature waived by consent of counsel.

DISTRICT COURT OF THE UNITED STATES

EASTERN DIVISION OF MICHIGAN

SOUTHERN DIVISION

THOMSON SPOT WELDER COMPANY

vs.

FORD MOTOR COMPANY

In Equity.

DEPOSITION TAKEN ON BEHALF OF THE DEFENDANT UNDER THE EQUITY RULES OF THE SUPREME COURT, UNDER THE REVISED STATUTES, BEFORE W. S. HELSLEY, ACTING AS SPECIAL EXAMINER BY CONSENT OF COUNSEL.

Warren, Ohio, October 25, 1919.

J. L. Stackpole, Esq., counsel for plaintiff; Melville Church, Esq., and A. S. Pattison, Esq., counsel for defendant.

Certificate of officer and signature of witnesses waived.

MR. GEORGE B. SAWYER, being called as a witness on behalf of the defendant and being first duly sworn, testifies as follows to questions by Mr. A. S. Pattison:

Question. Please state your name.

Answer. George B. Sawyer.

Q. Where do you live?

A. Warren, Ohio.

Q. What is your occupation?

A. Purchasing agent.

Q. For what Company?

A. Peerless Electric Company.

Q. How long have you been connected with the Peerless Electric Company?

A. Since the organization in 1902. Sixteen years, practically.

Q. What was your occupation prior to your employment by the Peerless Electric Company?

A. Preceding was with the Warren Electric and Specialty Company.

Q. How long had you been with that Company?

A. Some three or four years.

Q. What were your duties with the Warren Electric and Specialty Company?

A. I was purchasing agent there.

Q. Were you familiar with their catalogues and advertising matter?

A. I saw their catalogues and advertising matter and more than likely placed the order for the work.

Q. Do you know whether the Warren Electric and Specialty Company preserved in any way any of their catalogues and advertising matter?

A. They did.

Q. In what way?

A. At one time in scrap book form.

Q. I show you a book and ask you if you know what that book is?

A. I recognize the book as the old scrap book of the Warren Electric and Specialty Company.

Q. Do you know where that book has been; I mean what Companies have had this scrap book?

A. On the organization of the Peerless Electric Company it passed to them, as I understand it.

Q. From what Company?

A. The Warren Electric and Specialty Company.

Q. Has this book been in the possession of the Peerless Electric Company from the time it was turned over to them by the Warren Electric and Specialty Company?

A. For anything I know it has been here ever since, continuous.

Q. State whether, if you know, the Warren Electric and Specialty Company issued catalogues and bulletins of their desk fans?

A. They did. That was their custom, their practice.

Q. I call your attention to bulletins numbers 1, 2, 3 and 4, which are pasted in this scrap book, and ask you whether you recognize those bulletins?

A. I do.

Q. When were they published?

A. 1901. I think all of them.

Q. Do you mean for the season of 1901?

A. Yes, sir.

Q. Please explain, if you know, what was the object in issuing these bulletins?

A. I think it was to supplement the catalogue issue. The bulletins were sent out to the agents of the Warren Electric and Specialty Company and circulated as advertising matter.

Q. Am I correct in understanding that this scrap book was the property of the Warren Electric and Specialty Company and passed from them to the Peerless Electric Company when the latter Company purchased the Warren Electric and Specialty Company?

A. Your question is not quite right. The Peerless Electric Com-

pany did not purchase the Warren Electric and Specialty Company. When they organized the Warren Electric and Specialty Company was sold absolutely. The Peerless Electric Company was organized as a distinct and new company. They took over some things, however.

Q. State, if you know, whether the Peerless Electric Company took over the fan business of the Warren Electric and Specialty Company?

A. They did.

Q. And in taking over this they took at the same time this scrap book?

A. That was a part of the inheritance.

(The scrap book testified about by the witness is offered in evidence on behalf of Defendants and it is marked "Warren Electric and Specialty Company and Peerless Electric Company catalogue and bulletin scrap book number A-A-A-A.")

Cross-examination by MR. STACKPOLE:

X-Q. Mr. Sawyer, I find in this scrap book a number of references to the Colonial Fan and Motor Co. What relation, if any, had that Company to the Peerless Company?

A. Well, the Colonial Fan and Motor Company was simply a selling agency of the Peerless Electric Company. They manufactured nothing themselves.

X-Q. They sold the Peerless Fan?

A. Sold the Colonial Fan, made by the Peerless Electric Company.

X-Q. Did they sell any fans not made by the Peerless Electric Company?

A. Not to my knowledge.

X-Q. That is all.

MR. F. P. MCBERTY, being called as a witness on behalf of Defendants and being first duly sworn, testifies as follows to questions by Mr. A. S. Pattison:

Question. Are you the F. P. McBerty who has previously testified in this case?

Answer. I am.

Q. You testified in this case before Judge Killits that you were connected with the fan department of the Warren Electric and Specialty Company and also their successors, the Peerless Electric Company?

A. I did.

Q. Please explain the construction of the desk fan blade or blades as the case may be, that were manufactured and sold by

the Warren Electric and Specialty Company during the season of 1901?

(This testimony is objected to as not in response to the last testimony taken by the plaintiff.)

A. They had a desk fan made up with a steel spider which constitutes the center hub or support arms for carrying the blades, to which the blades were in some instances riveted, and the same general construction consisting of a steel spider in which the blades were spot-welded and also they had fan blades with a brass center which constituted the hub and a support arm for the fan blades, these blades riveted to the brass centers.

Q. How many rivets did the fan blades have which contained the brass center?

A. They had three rivets to the blade.

Q. How many rivets to the blade did the fan blades have which contained the steel center to which you have referred?

A. Two rivets to the blade.

Q. State what difference, if any, there was in the construction of the steel center with the two rivets for each blade and the steel center which you say was spot welded to the blades?

A. Steel center that was riveted to the blades were provided with holes punched to receive the rivets, the blades also had corresponding holes punched to receive the rivets, and the spot welded had no holes punched in the extended arms and the blades had no holes punched.

Q. Am I correct in understanding that the Warren Electric and Specialty Company manufactured and put on the market in the season of 1901 three types of desk fan blades, one with a brass center riveted to the blades, one with a steel center riveted to the blades and one with the steel center spot welded to the blades?

A. You are correct in that statement.

Q. Do you know whether the Warren Electric and Specialty Company issued catalogues and bulletins illustrating their desk fan products?

A. Yes, they did.

Q. Do you know what, if anything, was done to preserve any of these advertising catalogues or bulletins?

A. They had what was commonly called a scrap book into which they pasted copies of the various bulletins, catalogues and leaflets, as well as pages out of mechanical and electrical journals which carried illustrations of these products.

Q. Would you be able to recognize that scrap book?

A. I would.

Q. I call your attention to the book before you and ask you what that is?

A. That is the scrap book that was used for this purpose of preserving the advertising matter.

Q. State, if you know, what was done with this book when the Warren Electric and Specialty Company sold out its fan business?

A. This book passed into possession of the Peerless Electric Company, who purchased the fan motor interests of the Warren Electric and Specialty Company.

Q. The Peerless Company referred to by you, is that the Company which is occupying this office where we are now taking the deposition?

A. Same Company.

Q. I call your attention to bulletin number one, which is pasted in this scrap book, Defendant's Exhibit A-A-A-A, and ask you whether that illustrates either of the three types of fan blades which you say were manufactured and sold by the Warren Electric and Specialty Company in the year 1901?

A. That bulletin number one, season of 1901, illustrates the high grade desk fan equipped with the brass center blade with the three rivets mentioned.

Q. I ask you the same question in respect to bulletin number two?

A. Bulletin number two illustrates desk fan with the steel centers with the two rivet blade.

Q. I ask you the same question in respect to bulletin number three?

A. Bulletin number three illustrates the desk fan with brass center and three rivet blade.

Q. I repeat the question in respect to bulletin number four?

A. Bulletin number four illustrates Peerless fan with the steel center and spot welded blades or blades spot welded to the center.

Q. What season were these bulletins issued?

A. Those are in the season of 1901.

Q. What was the object, if you know, of sending out these bulletins?

A. Practice of sending out bulletins was adopted as it made it much easier to mail the circular covering a particular type of desk fan without sending a complete catalogue and also calling attention to the season's type.

Q. You have previously testified in this case that the steel center fan with two rivets to the blade was first manufactured and put on the market by the Warren Electric and Specialty Company for the season of 1901. What type of fan was this blade used on?

A. This blade was originally developed to take care of the demand for a comparatively cheap fan. The intention was to eliminate the expensive material used in the high grade fans.

Q. Which bulletin, if either of the four, to which I have called your attention shows the cheap type fan?

A. It is bulletin number four, illustrates the cheap fan.

Q. I notice and you have stated that bulletin number two has the steel center and the two rivets and this bulletin shows that type of blade attached to the "A-6" type of fan. What explanation, if any, have you to make in respect to this illustration?

A. This A-6 fan which is known as one of the high grade fans is apparently equipped with a fan blade having a steel center and possibly steel blades, brass plated, giving it the same appearance as a brass fan as far as the finish is concerned.

Q. How can the blade, the steel center blade as you say primarily developed for the cheap fan, be applied to the more expensive fan type "A-6" as shown in bulletin two?

A. I can best answer that question by saying that our fan shafts were all of a standard dimension, three-eighths of an inch in diameter, and any fan blade will fit any fan. This was standard practice with us all the time I was with the firm and still is.

Q. By that do you mean that the three types of blades manufactured for the season of 1901 were interchangeable in respect to the several fan motors that were manufactured with the different types of fans?

A. They were.

Q. Please state how many kinds, if more than one, of desk fan centers were manufactured and put on the market by the Warren Electric and Specialty Company for the season 1900?

A. Well, there was the brass strip center and the cast brass.

Q. Please examine the Warren Electric and Specialty Company's 1900 catalogue, which is pasted in the scrap book, Defendant's Exhibit A-A-A-A, and point out if you can the strip type of center that you refer to?

A. Well, this design is fully illustrated here on page eleven of the 1900 catalogue.

Q. How many rivets did this center have per blade?

A. There are two rivets per blade and four rivets in the center holding the strips to the hub.

Q. Of what material were the strips of this center made?

A. Made of brass.

Q. Does this catalogue show any other type of center than the strip one to which you have referred?

A. No, there is no other type of the center illustrated in this catalogue excepting the strip center.

Q. Was this strip center placed on the market by the Warren Electric and Specialty Company at a succeeding season after the year 1900?

A. It was not.

Q. Why?

A. The design proved too weak and ineffectual, causing a lot of trouble and expense. We were compelled to replace defective blades.

Q. By this do you mean that the strip brass center was abandoned after its use in the season of 1900?

A. Yes, it was entirely abandoned after the season of 1900 on account of this weakness.

Q. Have you examined the Plaintiff's Exhibit 51 now on file in the court at Detroit which is stated by the witness for the plaintiff to be a Warren Electric and Specialty Company's G-1 desk fan?

A. I have.

Q. When and where did you examine this?

A. I examined this fan in the clerk's office of the court in which this case is pending at Detroit, Michigan, on Thursday, October 23, 1919.

Q. Are you able to say whether this Plaintiff's Exhibit 51 does or does not contain a G-1 type of fan blade made by the Warren Electric and Specialty Company?

A. It is impossible for me to positively identify that fan blade as having been made by the Warren Electric and Specialty Company?

Q. Why?

A. There were other makes of fans being placed on the open market at that same time that had blades and centers of the same shape and design, same diameter, and would fit the same shaft.

Q. Please describe, if you noted, the general condition of the fan and its blade?

A. The motor itself together with its accompanying guard are in an excellent state of preservation; motor is clean; bearings are tight and the commutator is smooth, and apparently not been worn much. The fan blades are in bad mechanical condition, blades having been apparently bent repeatedly and the center itself is out of true, indicating hard usage and possible extended service.

Q. What, if anything, have you to say in view of these facts as to whether that motor and fan blade are the original motor and fan blade as sent out by the manufacturer?

A. From my knowledge of desk fans and motors I would say that that fan blade did not belong to that motor, or in other words, it was not the original blade sent out with the motor in question.

Q. Did you note the rivets on the fan blade of Plaintiff's Exhibit 51?

A. I did.

Q. What, if anything, did you notice about these?

A. These rivets have all indications of being machine riveted; that is, they have been riveted by a mechanically operated riveting machine.

Q. Did the Warren Electric and Specialty Company use a riveting machine of any kind that would produce the results shown on the fan blade, Plaintiff's Exhibit 51, during the year 1901?

A. No, they did not have any riveting machine at all, riveting all their fan blades by the aid of a rivet set and a hammer.

Q. Does the condition of the rivets on the fan blade of Plaintiff's Exhibit 51 enable you to say whether it could possibly be the Warren Electric and Specialty Company's 1901 blade?

A. That is impossible for me to say definitely. If the rivets are machine driven it could not have been made by the Warren Electric and Specialty Company.

Q. Are you familiar with the appearance of hand and machine headed rivets?

A. Yes.

Q. What is your opinion as to whether the rivets in the blade of Plaintiff's Exhibit 51 being hand headed or machine headed?

A. My opinion would be that they were headed up with aid of a machine riveter.

Q. While you were in Detroit on the 23rd did you examine the Plaintiff's Exhibits No. 40 and No. 41, which were offered in evidence as a fan motor and fan blade manufactured by the Warren Electric and Specialty Company?

A. I did.

Q. What, if anything, did you notice during this examination of these exhibits?

A. The thing that struck me most forcibly was that the fan blade did not belong on that fan motor.

Q. What enables you to say that?

A. The fan was a nickle plated blade, while the general finish of the fan motor is polished brass. A standard practice was to make all of the metal parts correspond in finish, being entirely polished fan known as the brass finish fan or all nickle plated, if it is known as the nickle plated fan.

Q. The 1901 Warren Electric and Specialty Company's catalogue, page 17, refers to "G" type of fan as "rigid Iron Clad Fans;" please explain, if you know, what this description of that fan means?

A. The intention of that description was to indicate that all of the parts of the fans that could be possibly made of iron were manufactured of that material such as the fan blades, fan centers, hubs and guards.

Q. In connection with the testimony of Robert W. Clark, the witness produced in rebuttal by the Plaintiff, there was offered in evidence as "Plaintiff's Exhibit 18, specimen of spot welding prepared by Clark," a number of spot welded specimens showing the spot welding of blades or bars of steel of various thicknesses. I have asked you to prepare a specimen of spot welding showing the parts of metals. If you have done so, will you please produce the same and explain it?

A. The samples that I have here are samples that I spot welded on one of my commercial welding machines of a similar type and consisting of two pieces of thin steel spot welded together; to one

piece of this thin steel is spot welded a piece of commercial tinplate; and to this piece of commercial tinplate is spot welded another piece of tinplate of the same gauge and cut from the same sheet. To this second piece of tinplate is spot welded a piece of black steel wire, and to this piece of steel wire is electrically welded a second piece of wire at right angles to the first piece.

Q. State what kind of electrodes you used?

A. This entire demonstration was done with the aid of two copper electrodes that are used in one of our standard spot welding machines.

Q. Please explain more fully the characteristics of what you have referred to as tinplate?

A. The tinplate, commonly known as commercial tinplate, consists of thin steel plate which is pickled to remove all impurities and scale and then dipped into a bath of melted tin which puts a fine deposit of tin over the entire surface of the plate on both sides.

(Defendants counsel offers in evidence the specimen produced by the witness and the same is marked "Defendant's Exhibit McBerty specimen exhibiting welding of different metals by use of copper electrodes.")

Q. Please produce if you can the copper electrodes of which the specimen just offered was welded?

A. I have here two copper electrodes that were used in this welding machine to produce the previous specimen or sample of spot welding.

(Defendant's counsel offers in evidence the electrodes just produced by the witness and the same are marked "Defendant's Exhibit McBerty copper electrodes used for spot welding different metals.")

Q. I now show you another specimen of spot welding work and ask you to tell us what it is and how it was made?

A. This second sample demonstration was produced from identically the same grade of material of the previous sample spot welded with the copper electrodes and consists of a thin piece of commercial steel sheet welded to another piece. Second piece of steel sheet is welded to a piece of commercial tinplate. This piece of commercial tinplate is spot welded to a second piece of tinplate of the same grade of material, and to this second piece is spot welded two pieces of black steel wire and to these two pieces of black steel wire is spot welded a third piece of black steel wire at right angles.

Q. What kind of electrodes was used in welding these specimens you have just described?

A. This specimen was welded in every particular with the aid of two steel electrodes made out of commercial cold roll steel bar, the points of same being approximately the same shape as our copper electrodes and being held in the same machine that was used in spot welding with the copper electrodes.

(Defendant's counsel offers in evidence specimen referred to in the last question and the same is marked "Defendant's Exhibit McBerty specimen exhibiting welding of different metals by use of steel electrodes.")

Q. Please produce, if you have them, the steel electrodes referred to in your preceding answer with which you welded your second specimen?

A. I have here the two steel electrodes which were used in our standard spot welding machine for producing the second specimen of sheet metal spot welding.

(Defendant's counsel offers in evidence the electrodes produced and the same are marked "Defendant's Exhibit McBerty steel electrodes used for spot welding different metals.")

Cross-examination by Mr. STACKPOLE:

X-Q. Did you ever in 1901 or thereabouts weld steel fan blades to the arms of brass centers?

A. No, never did.

X-Q. What is the diameter of the copper electrodes used by you in making Defendant's Exhibit McBerty exhibit welding of different metals by use of copper electrodes? What was the diameter of the point of the electrodes?

A. The diameter of the electrode, the copper electrode itself, was seven-eighths of an inch, and the point of contact with the metal was approximately an eighth of an inch.

X-Q. How high was the bell from the end of the electrode, the part where it reaches its full width?

A. That is difficult to say without measuring, but approximately five-sixteenths of an inch from the end of the point to the upper edge of the bell.

X-Q. And what are the corresponding dimensions in the steel electrodes used by you in welding the other specimens?

A. Approximately the same. The intention was to make them the same dimensions and general shape.

X-Q. Do you equip any of your spot welding machines with steel electrodes like those in evidence for commercial use?

A. We do not.

X-Q. You made these specimens and used these electrodes at the request of counsel for the Defendant?

A. I did.

X-Q. In the case of the brass strip centers used by the Warren Company in 1900 were the strips fastened to the face of the hub?

A. They were.

X-Q. So that no part of the hub projected between the strips?

A. That question is rather indefinite. That is, between strips of the lateral surfaces?

X-Q. Yes.

A. There was no part of the hubs between the strips.

X-Q. On page fourteen of the Peerless catalogue of 1900 at the bottom the hub is shown as projecting between the strips or arms, is it not?

A. No, it does not show it extending between the strips. It extends up the side of the strips.

X-Q. Extends up the side of the strips?

A. Yes, sir.

X-Q. What do you mean by that?

A. Just what I said. It extends up the side of the strips.

X-Q. Is that true of the cut on the top of the page?

A. No, sir; it extends also up the side of the strip.

X-Q. And you say that the cut at the bottom of the page fourteen does not show the hub extending out between the two strips?

A. No, sir.

X-Q. It seems to me that the hub does extend between the two strips that are approximately extending towards the observer on the part that is shown are direct on the hub. Will you look again and see if that is not true?

A. That extends right up beside the strip. Your strip runs in here and your hub extends up on each edge of it at the side of the strip, but it does not extend between the strips at all.

X-Q. I think we have been using different terms and meaning the same thing. As I look at this figure on page fourteen at the bottom there was a part of the hub which projects into the angle between the two arms of the spider?

A. Into the angle at the intersection of the two arms, yes, sir.

X-Q. And in figure on page ten as I look at it there is not part of the hubs which extend into the angle between the two arms of the spider; is that true?

A. That I would say that it did because this bar here comes apparently square into the side of the hub.

X-Q. The cut on page ten is a view taken rather from the back of the hub, is it not?

A. Yes, sir.

X-Q. Now, looking at the cut at the top of page ten tell me whether the hub extends into the angle between the arms?

A. I couldn't say about that. I couldn't say whether it did or did not.

X-Q. Do you see any recess cut in the hub there to receive the arms?

A. My eyesight is too poor to see whether there is or is not a recess in there.

X-Q. In all of the cuts in the 1900 catalogue there are shown two rivets or rivet holes on the middle line of each blade. Is not that true?

A. That is, you are referring to these rivets?

X-Q. Yes, on the middle line?

A. That is, in the blades? Yes, all the cuts indicate the two rivets per fan blade.

X-Q. On the center line?

A. On the center line of the blade.

X-Q. Does this 1900 catalogue show all the types of fans put out by the Warren Company in 1900?

A. The types of fans?

X-Q. Desk fans?

A. That shows all the types that was produced at that time, that is, that season.

X-Q. On page twenty-nine of the American Electrician for April, 1901, which appears in the scrap book, is a cut of the type E-2 fan. Does that show a brass spider or the steel spider?

A. That would indicate from the place of the rivets that is a brass spider.

X-Q. How many rivets can you see on each of the blades in this picture?

A. On the upper blade I can see three rivets distinctly, on the middle blade——

X-Q. Right or left?

A. On the left middle blade there are shown two rivets placed about equal distance from the edge of the blade which would indicate there was a third rivet on that same blade. On the other two blades owing to the way the light apparently struck the blade the rivets did not show.

X-Q. Were there any fans made in 1902 with steel centers?

A. Yes, sir.

X-Q. Which ones?

A. That is, you refer now to fan motors or fan blades, you mean fan motors equipped with steel centers? Yes, the G type we equipped with those as well as other types.

X-Q. What other types?

A. Well, I couldn't say definitely, the other types that was ordinarily equipped with the brass blades and brass centers.

X-Q. They might be in type then?

A. They might be in type.

X-Q. I find a catalogue of the Colonial Fan and Motor Company which appears to be for the season of 1903. Look at the cut of the

type S-3 fan shown on page seven. How many rivets do you see on those blades?

A. I don't see any indication of any rivets at all on those blades.

X-Q. And how about the S-4 fan on page nine of the same catalogue?

A. That does not show any as far as I can see either.

X-Q. Look at the cut on page twelve of the Electrical Review for May 9, 1903, showing a Peerless fan. Do you see a rivet head on the right hand blade and lower blade?

A. No, I do not see any rivets on the right hand blade or the lower blade.

X-Q. Calling your attention to the cut of two Peerless fans in a bulletin or advertising matter of 1910 of the Peerless Electric Company. Do these cuts show steel spiders or brass?

A. Those cuts show steel spiders?

X-Q. Why?

A. They have two rivets to a blade, centrally located.

X-Q. Any other reason?

A. No, that would be the only reason I could attribute to their being steel spiders.

X-Q. Are these 1910 steel spiders of the same description as the steel spiders you say were used in 1901?

A. Yes, that would be the same type of steel spider.

X-Q. Now, in the Peerless catalogue of 1910, a copy of which I find loose in this scrap book, are the spiders shown steel or brass of the desk fans?

A. The shape of all of these spiders indicates they are stamped steel.

X-Q. Like you say you used in 1901?

A. Yes, sir.

X-Q. And they were put on the fan the same way, were they?

A. As far as I know they were. I wasn't at the Peerless Electric Company's plant in 1910.

X-Q. Did you have any steel spiders in 1900?

A. We did not.

X-Q. Or steel blades?

A. I couldn't say in reference to the steel blades. We had the dies to produce the steel blades.

X-Q. You did say on the spiders you did not have any?

A. Yes.

Redirect examination by Mr. A. S. PATTISON:

Rd-Q. After the fan business of the Warren Electric and Specialty Company was taken over by the Peerless Company the latter part of 1902, please state whether your connection with the fan department continued as intimate as it was before the transfer?

A. It was not. I became general superintendent of the Peerless

Electric Company as soon as that Company was organized and devoted almost my entire attention to the development of a line of power motors and merely had a general supervision of the fan motor product with practically no time devoted to improving or further developing of the fan or fan motors.

Rd-Q. What was your title with the Warren Electric and Specialty Company before they sold their fan department to the Peerless Company?

A. I was superintendent of the fan motor department.

Rd-Q. But after the fan department was taken over what was your title with the Peerless Electric Company?

A. I was general superintendent of the Peerless Electric Company.

Defendant's counsel offers in evidence the following:

(1) Certified copy from the records of the U. S. Patent Office, extracts from the German publication entitled "Patentblatt," issue of March 14, 1906, covering title page and pages 363 and 373, and the same is marked "Defendant's Exhibit Number B-B-B-B extracts from Patentblatt of March 14, 1906."

(2) Certified copy from the records of the U. S. Patent Office of extracts from the official German publication entitled "Patentblatt," issue of June 22, 1904, covering title page and pages 863 and 867, and the same is marked "Defendant's Exhibit C-C-C-C extracts from Patentblatt issued June 22, 1904."

(3) Translation of portion of Exhibit B-B-B-B which is marked "Defendant's Exhibit D-D-D-D."

(4) Translation of portion of Exhibit C-C-C-C which is marked "Defendant's Exhibit E-E-E-E."

It is agreed that the translation is admitted subject to correction if found incorrect.

(5) A printed copy of U. S. Patent to A. M. Stanley, Assignor to General Electric Company, Number 1,176,614, dated March 21, 1916, and the same is marked "Defendant's Exhibit F-F-F-F."

It is hereby stipulated and agreed by and between counsel for the respective parties hereto that the exhibits introduced in connection with the testimony taken by way of deposition out of court or by way of deposition in open court before or during the session before Judge Killits on May 19th, 20th and 21st, 1919, if not all marked as filed, may be marked by the Clerk as filed of the said 21st day of May, 1919; and further that the depositions and exhibits introduced by either party since said last named date, if not all marked as filed may be marked by the Clerk as filed on the day of final hearing herein.

(No Model.)

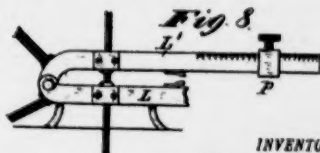
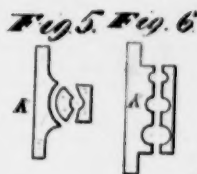
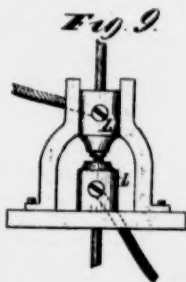
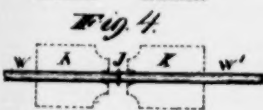
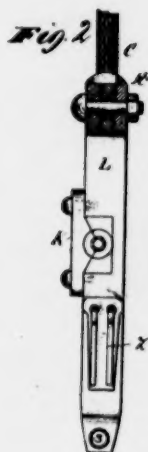
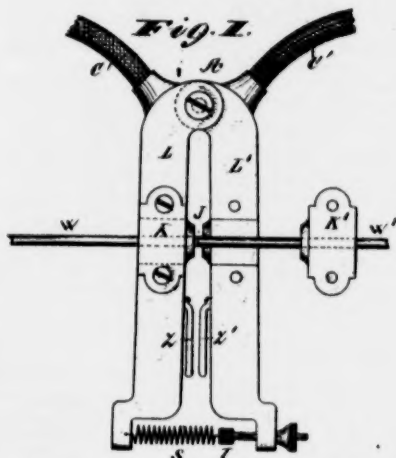
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E. THOMSON.

APPARATUS FOR ELECTRIC WELDING.

No. 347,140.

Patented Aug. 10, 1886.



WITNESSES:

Edw. J. M. Golding
W. H. Capel

INVENTOR

Elihu Thomson.

BY

W. B. Townsend
 ATTORNEY

(No Model.)

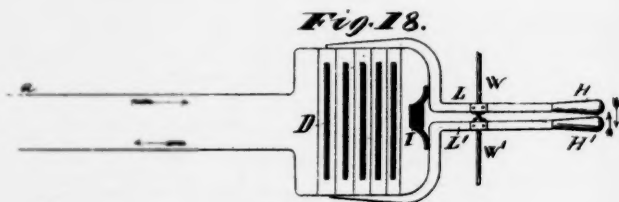
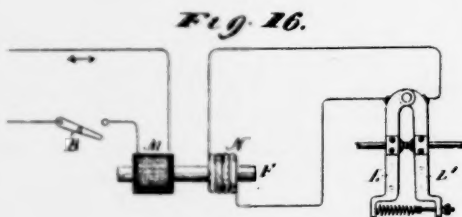
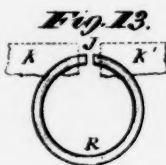
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WITNESSES:

General J. W. Galtley
W. H. Capel

INVENTOR

Elihu Thomson

BY

J. C. Thomson
 ATTORNEY

1023

UNITED STATES PATENT OFFICE.

ELIHU THOMSON, OF LYNN, MASSACHUSETTS.

APPARATUS FOR ELECTRIC WELDING.

SPECIFICATION forming part of Letters Patent No. 347,140, dated August 10, 1886.

Application filed March 29, 1886. Serial No. 197,077. (No model.)

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, and a resident of Lynn, in the county of Essex and State of Massachusetts, have invented a certain new and useful Method of and Apparatus for Electric Welding, of which the following is a specification.

My invention consists in a novel art or process of and apparatus for forming joints between metal wires, bars, and the like by the agency of an electric current. This art or process I term "electric welding."

One of the chief objects of my invention is to secure a true and firm joint between metal wires, &c., without the usual necessary application of solders or metals melting at a lower temperature, and to secure a complete weld of the two abutted ends, which shall be as strong and firm as any other part of the wires, bars, &c., used.

My invention enables sections of wires—as of copper and its alloys, iron, silver, gold, &c.—to be jointed into one continuous length, and the joints, being of the metal itself nearly uniform in texture with the rest, are strong, and can be bent, twisted, hammered, and drawn without rupture—a result not achieved before my present invention.

Briefly, the new art, which I term "electric welding," consists in bringing together with a certain pressure the ends of the wires, bars, &c., to be jointed, and which pressure must be small, and can with my apparatus be regulated at will, and then constituting the abutted ends and a slight portion of the wire or bar on each side of such ends as the path for an electric current of great volume, but not necessarily of an electro-motive force of more than a few volts, (depending on the nature and size of wire or bar.) With large bars the current must be much greater than with small bars or wires, and it is well to employ as a source of current a regulable apparatus. Either continuous, intermittent, or alternating currents of electricity may be employed.

I will now proceed to describe, by reference to figures, the manner in which I have practiced the process and the apparatus which I have found suitable therefor.

Figure 1 shows my jointing-clamp with wires ready to be electrically welded. Fig. 2

is another view of a portion of the same. Fig. 3 shows the placing of wire or bars in line in the clamps before abutting the ends for welding. Fig. 4 shows a joint just formed, there being usually a slight burr or flange formed at the junction after passage of current. Fig. 5 shows removable clamps for holding wires of varying sizes. Fig. 6 shows a clamp for holding wires of three sizes as needed. Fig. 7 indicates the substitution of manual pressure for elastic pressure in forming the joint. Fig. 8 indicates the substitution of gravity for elastic pressure in forming the joint; Fig. 9, a modification of the same. Figs. 10, 11, 12, 13, 14, and 15 indicate the application of my process to other forms of bar, &c. Fig. 16 illustrates one of the ways of generating the heavy currents needed in the practice of my invention. Fig. 17 illustrates a modification of a portion of Fig. 16. Fig. 18 shows another way of obtaining currents of sufficient volume for practicing my invention.

I reserve for other applications for Letters Patent certain other improvements in the apparatus used in practice.

In Fig. 1 is shown the apparatus applicable to the case of joining ends of wires, &c. It consists of two arms or clamp-holding bars, $L L'$, one only of which need be movable. This is swung on a joint at A, which, when the arms $L L'$ are wholly metallic, is insulated by interposed washers and tube of insulating material, as mica, in a way to allow the free movement at A, but no passage of current at such point. Heavy cables $C C'$, preferably very many times the section of the wires to be jointed, connect $L L'$, respectively, with the terminals of apparatus, from which, at will, a sudden flow of current of considerable volume may be obtained. Suitable clamps, $K K'$, (this latter, K' , shown removed,) serve to bind down firmly and make good electrical contact with a portion of the length of the wires to be jointed. The wires $W W'$ —any of copper, brass, iron, steel, or German silver—are placed in the clamps with their ends abutting and projecting, as shown at J, the edges of the clamps being countersunk or rounded, so as to leave a small portion of W and W' unclamped near J. An adjustable spring, S, arranged to pull $L L'$ together, but insulated by an interposed block of insulator I, is used to

keep the wires $W W'$ abutted with a slight pressure. I sometimes provide a set of heavy copper contacts, $Z Z'$, which automatically connect $L L'$ after the joint at J is effected, accompanied, as it is, by the slight approach of the parts $L L'$ under the action of the spring S when the metal at J welds.

Fig. 2 shows one leg, L' , removed and the remaining one, L , seen from between them, showing opening for wire and insulation of joint A in black.

Fig. 3 shows wires $W W'$ just before abutting together with their relation to the clamps $K K'$. When in contact, as in Fig. 1, a powerful current is passed from C to C' , which current has to pass the abutted ends at J . However, if of great volume, even though the resistance at J be less than one fifty-thousandth of an ohm for very moderate-sized wires, heat will be developed in the ratio of the square of the current flowing, which heat will be formed at J in sufficient amount to fuse the abutted ends, and under slight pressure they will weld over their whole section with a slight projecting burr or expansion, as indicated at J , Fig. 4. This will be seen to occur by the slight yielding at J and the approach of $L L'$ toward each other by the elastic force of S . The current is then stopped and the clamps removed, and the wires $W W'$ will now be found united into one. The burr can be readily filed off or ground off, and if the clamps $K K'$ were set oppositely at the start the joint will be true with the axis of each wire. Of course it is important that the wires shall be clean to insure contact, and though usually the joint is well formed without any flux, such as borax, there is no objection to its use in slight amount in certain cases. In such cases, after abutting the wires, a little moist powdered borax or other flux may be applied at J . The clamps for holding the wires may be made removable shells, so as to be readily substituted when different sizes of wire are to be clamped, although simple V-grooves may be made in the clamps to accommodate various sizes; or universal chucks may be employed. All such variations are without importance, and are evident to mechanics.

Fig. 5 shows removable clamps, and Fig. 6 a compound clamp with three sets of grooves of different sizes.

In Fig. 7 the spring S , Fig. 1, is left off, and is replaced by handles, which may be manually pressed together in forming the joint. A little practice will show the pressure to be used in each case.

In Fig. 8 an adjustable weight, P , sliding on L' , extended, which latter may be graduated, forms an efficient substitute for S , Fig. 1, the other parts being suitably disposed.

Instead of using a swinging joint, as A , Fig. 1, it is sometimes preferable, as where heavy wires are to be accurately abutted and jointed, that the movable piece L shall slide in guides, giving a rectilinear motion, though

equivalent parallel or right-line movements may be attained in other well-known ways.

The clamps $K K'$ can be shaped to suit various forms of wires or bars to be joined—such as square, hexagonal, rectangular, &c.—and it will be evident that tubes can be operated upon instead of bars or wires.

Fig. 10 shows two rectangular bars prepared for juncture.

Fig. 11 shows how my invention may be employed to effect joints between pieces of different form, W' in the figure being a flanged head. In this connection it may be remarked that my invention gives a great advantage in permitting the formation of joints without heating the metal to any considerable distance on each side of the joint, so that temper, elasticity, and finish remains uninjured.

Fig. 12 illustrates the union of a rectangular bar to a round bar. It may be here said that in all cases it is best that the clamps for holding the pieces be fitted to the shape of the pieces, and clamp them quite near the junction. In such way even rings, as in Fig. 13, may be rendered endless; but in this case more current is needed, as a portion passes around the ring; but, further, on account of the greater length, it is small compared with the portion traversing the joint when the clear ends are well abutted and the clamps $K K'$ embrace the ring, as indicated. In Fig. 13 the lower part of the ring B can, if needful, be immersed in water to avoid any chance of heating.

In Fig. 14 a long bar or wire of metal or a band can be made endless, as in Fig. 13, and I propose to apply my invention to the production of endless steel pieces for band-saws and the like, and so to remove the weaker brazed joint and the consequent destruction of temper near where it is made. My invention can also be applied to the production of endless wires for endless twisted cables, and it may also be used to join the separate ends of the wires of a twisted cable and so make the cable endless. It is also possible to join two smaller pieces to one larger piece, as in Fig. 15.

To insure success in effecting a joint the parts opposed should, if possible, be of the same section or at least of such dimensions and melting-points as to melt nearly at the same time, and so secure a thorough union of the particles of both pieces. However, junction is easily effected between German silver and steel or iron and between brass and iron, and in many other cases where the metals joined differ.

As an example of a means of securing a large flow of current with little electro-motive force, such as is demanded by my invention, the arrangement shown in Fig. 16 is used. In this case an induction coil consisting of a core, F , of iron wire wound with two windings is employed. One of the windings is of fine wire, M , and connected into a circuitary

plying alternating currents suited to the size wire in M, while a simple switch, B, controls the circuit through M. The other winding, N, is a very few turns of very heavy conductor connected by short and thick connections to the wire-jointing clamps L L', as in Fig. 1. When all is ready to make a joint, the switch B is closed for a second or two, at which time the currents in N will be induced, and since the resistance of the wires to be joined will be a large fraction of the actual resistance in the secondary circuit, so a large portion of the energy will be evolved where the joint is to be made, incipient fusion will result and subsequent thorough welding. To save parts it may be simpler to give the coil N the disposition indicated in Fig. 17 by attaching L L' to its terminals, and having the terminals possess a slight elasticity toward one another, so as to give the pressure needed to make the joint.

In Fig. 18 is illustrated the employment of a cell of secondary battery as a source of current. It need only be a plain Planté battery of large surface, so as to yield, on occasion, many thousands of amperes, according to the diameter and the conducting power of the wires to be joined. It is charged by being placed in a circuit, *ab*, of moderate current-supply, such as an arc or other line.

The heavy conductors L L', one from each terminal of the battery, are ordinarily sprung apart and insulated, as at I. When the wires W W' are in place, they are kept out of contact until the charge of the battery is sufficient to give a flow of current of a few seconds duration, at which time the handles H H' are pushed nearer together, thus effecting contact, fusion, and welding between the ends of the wires W W'.

Other sources of electricity may be used, such as currents from large dynamos, either direct current or alternating in character.

Instead of employing the pressure of a spring, or gravity, or manual pressure to effect the welding, I may obviously employ pressure obtained from any other source.

What I claim as my invention is—

1. The herein-described art of effecting union between two pieces of metal, consisting in holding the same in contact at the point of union and simultaneously passing a current of electricity through the joint of a power to fuse and unite the pieces, as and for the purpose described.

2. The process or art of electric welding,

consisting in the application of heavy currents to traverse a joint to be welded, and the simultaneous application of a pressure or force tending to move together the pieces to be welded. 60

3. The process or art of causing union between the ends of metal pieces in contact by simultaneous application of fusing-currents of electricity and mechanical pressure at the contact. 65

4. In an apparatus for electric jointing of metals, suitable clamps for holding the pieces to be joined movable toward one another, and means, such as a spring, for exerting a pressure for forcing the pieces into contact, and 70 means of applying fusing-currents of electricity while such pieces rest in pressure contact, as described.

5. The combination, in an apparatus for electric welding, of two arms or supports, L L', connected with a source of electric current, removable dies or holding-clamps carried by said arms, and means whereby said arms may be pressed toward one another, as and for the purpose described. 75

6. The combination, in an apparatus for electric welding, of clamps or holders for grasping the pieces to be welded, connections from said clamps to a suitable source of electric current, and an adjustable spring, or its 85 equivalent, as described, for adjusting the force with which the pieces are pressed toward one another during the operation of welding.

7. In an apparatus for electric jointing of metal wires, bars, &c., a primary feeding-line 90 connected to any suitable source of current and controlled by a switch, and a secondary fusing or welding circuit connected to the pieces to be welded, and which are held in pressure contact, together with suitable means 95 of transfer of energy from said primary line to the circuit of the fusing or welding apparatus, as described.

8. The art or process of electric welding, consisting in applying to suitably guided and 100 clamped pieces to be joined a powerful electric current at the junction simultaneously with a pressure, whereby upon incipient fusion at the joint a complete union is effected.

Signed at Lynn, in the county of Essex and 105 State of Massachusetts, this 23d day of March, A. D. 1886.

ELIHU THOMSON.

Witnesses:

W. O. WAKEFIELD,

E. H. KITFIELD.

(No Model.)

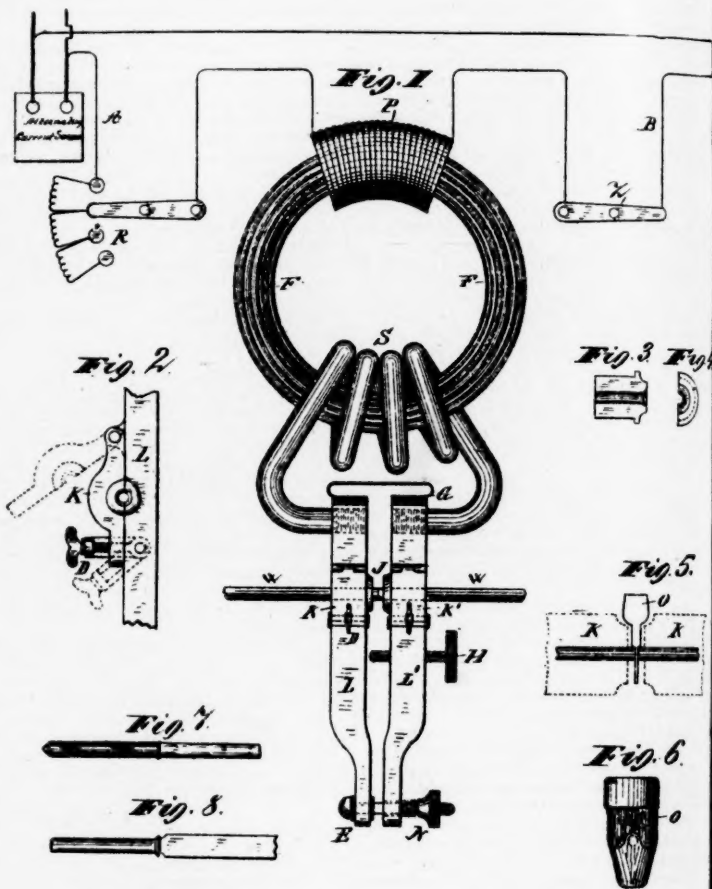
2 Sheets—Sheet 1.

E. THOMSON

APPARATUS FOR ELECTRIC WELDING.

No. 347,141.

Patented Aug. 10, 1886.



WITNESSES:

Gabriel J. W. G. G. G.
 Wm. H. Capel

INVENTOR

Elisha Thomson

BY

H. B. Trueman
 ATTORNEY

(No Model.)

2 Sheets—Sheet 2.

E. THOMSON.

APPARATUS FOR ELECTRIC WELDING.

No. 347,141.

Patented Aug. 10. 1886.

Fig. 9.

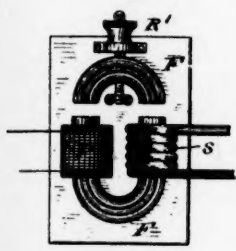


Fig. 10.

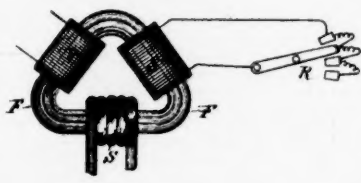


Fig. 11.

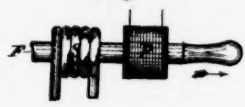


Fig. 12.

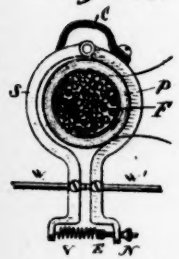
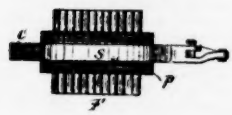


Fig. 13.



WITNESSES:

Charles J. W. Galtier.
Wm. H. Capel.

INVENTOR

Elihu Thomson

BY

H. L. Townsend
ATTORNEY

UNITED STATES PATENT OFFICE.

ELIHU THOMSON, OF LYNN, MASSACHUSETTS.

APPARATUS FOR ELECTRIC WELDING.

SPECIFICATION forming part of Letters Patent No. 347,141, dated August 10, 1909.

Application filed March 29, 1908. Serial No. 397,098. (No model.)

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, and a resident of Lynn, in the County of Essex and State of Massachusetts, have invented a certain new and useful Apparatus for Electric Welding, of which the following is a specification.

My invention relates to an improved apparatus for the practice of a new process or art of welding by electricity, which forms the subject of a separate application for patent.

The object of my invention is to facilitate the operation and provide for its control.

It consists of a regulable source of current provided with an induction apparatus, to be presently described, and also of a means for easily clamping the pieces to be welded and of setting them in position.

Figure 1 shows my improved apparatus; Fig. 2, a clamp for quick work in clamping and unclamping pieces to be joined and that have been joined or welded. Fig. 3 shows the form of one of the removable clamping-blocks for wire; Fig. 4, another view of the same; Fig. 5, a stop for insuring proper placing of the pieces to be joined. Fig. 6 is another view of the same. Fig. 7 is one example of the work that can be accomplished. Fig. 8 shows another example of the same.

A B, Fig. 1, are wires leading from a source of alternating electric currents to the coil of insulated wire P, wound around a ring-shaped iron core, F F, as shown. The coil P has a number of turns, depending on the electro-motive force and current supplied to it, its convolutions being usually numerous when used with average electro-motive forces and current strength. The connection of A and B to P is made so that a variable resistance, R, (or the equivalent may be substituted for it,) may be inserted in greater or less amount, so as to vary the force of the primary circuit-current in the coil P, and the switch Z permits of rupturing such circuit at will. Around the same iron core F F are also wound a few turns of heavy copper cable S, giving an almost inappreciable electrical resistance. The ends of the secondary coil are attached each to one of a pair of clamp-bearing arms or blocks, L L', of good conducting metal, relatively placed and guided so as to have only a slight move-

ment toward and from each other. For such purpose an insulated flexible plate, as at G, may be used in conjunction with an insulated pillar borne by I, at E, and passing through a hole in L'. A nut, N, and compressed spring strong on said pillar permit said pillar to be used for drawing arms L L' toward each other with a pressure depending on the position of the nut N. The clamps K K' are placed opposite one another on arms L L', respectively, and a screw, H, serves as needed to force arms L L' apart and hold them so separated. The clamps K K' are made so as to hold in place the replaceable divided disc or sleeve for holding wires or other pieces near the point of welding or juncture.

In order to manipulate the clamps rapidly, they are preferably made as in Fig. 2, where the body K is hinged to L, and the free end arranged to be set or clamped by a movable clamp-screw in a swinging frame, D, as shown.

The dotted lines show the parts contained. The removable parts surrounding the wire or bar to be welded are like Figs. 3 and 4, and are made of copper or other good conductor in halves, the size of internal bore being exactly equal to the dimensions of the bar to be clamped, and each bore is somewhat counter-sunk, preferably at the end where the wires, W W', to be joined are shunted at J, Fig. 1. The wires or bars W W' should be set projecting a little from the clamp-blocks when shunted, and to secure this I have devised a stop-plate, O, Fig. 8, for insertion between the clamping-blocks K K', as indicated, each plate O having a thin portion against which the wires may be shunted, and a thicker portion immediately above for insertion between the clamp-blocks, so as to determine their distance apart during the insertion of the wires. The removal of O leaves the wires free to shut and yet project some little distance from the clamps.

Fig. 6 shows the stop-plate O on its flat side, while in Fig. 5 it is seen edgewise.

The operation of my apparatus is as follows: The wires or bars W W', of iron, steel, German silver, brass, copper or its alloys, &c., having been inserted into the clamps by the aid of the plate O or without it, and the screw H, Fig. 1, turned back, so as not to in-

series with the approach of L. 1', under the action of the spring under the seat H, the switch 2 is momentarily closed to permit circulating currents to flow in coil F. These induce very heavy currents in S, which increase the position or shunted ends of W W', separating from the clamps. The instantaneous result is partial fusion of such ends and secure into one piece by the force of the spring under seat H. Suitable adjustments of current and electric pressure are readily made to suit the size of bars or wires and their conducting power, or to fuse or electrically weld them. Joints of steel with steel or iron are thus easily fused, or with German silver or brass, or of iron with brass, or with iron, steel, or German silver, &c.

Other means of regulating the current given out by S may be used, some of which are indicated in Figs. 9, 10, 11, 12, and 13.

In Fig. 9 the iron core F is divided, and one portion is made movable toward and from the other, so as to more or less completely close the magnetic circuit of the core by a regulator, H, or the like.

In Fig. 10 the core has another coil, F', wound on it, to the circuit of which a variable resistance, R, may be inserted as required. This coil F', when in short circuit, will scarcely exert any effect in S, but when its open circuit will give to S its full power, and with varying resistance in its circuit the current induced in S will vary. Its effect is similar to placing a steel tube of support of greater or less diameter around the core or parallel to the secondary S.

In Fig. 11 the core F is made movable 's out of the axis of S, to vary the current passing inductive currents in S.

In Figs. 12 and 13 the core F is surrounded by the primary coil F', as shown, and is of not dissimilar that a single bar of copper, S, also from the secondary, and whose position is opposite the coil F' and core F may be changed from the maximum position shown to any other. In this case the balance of the bar S also replaces the core L. 1' by being bent, as shown, and preventing a free in side connection or short, C, around the magnet. The wires W W', or bars to be joined, are held against by clamping screws, and are joined together by an automatic electric spring, V, which is prevented from making contact between the separated ends of the bar S by insulation, as at R.

Other methods of regulating the discharge of current may be used, and my invention is not limited to such particulars.

What I claim as my invention is:—

1. In an apparatus for electric joining or welding, a source of heavy electromotive forces for regulating the same, in combination with means for holding the pieces to be united, and with a means of imparting a compressing force to them such pieces together.

2. In an apparatus for electric joining or welding, the combination, with devices for holding pieces to be united, of a coil wound upon an iron core and connected with a source of electricity, a secondary coil on a core of low magnetic permeability, iron and secondary coil in the holding device, and means for carrying the magnetic induction effects of the one upon the secondary, as set forth in the foregoing description.

3. In an apparatus for electric joining or welding, the combination, with devices for holding pieces to be united, of an induction apparatus wound with two coils, one of low magnetic permeability and the other, in combination with the low permeability coil the holding device, and a source of electric current connected with the coil of comparatively high permeability.

4. The combination, with the clamping device and means for connecting the same with a source of electricity, of a coil placed, having a thin portion, against which the pieces to be united may be placed, and a sliding contact, against which the clamping device may slide, so as to disengage their contact upon the separation of the pieces to be joined.

5. In an apparatus for electric welding, a regulable source of current of electricity and means of passing the same through the pieces to be united and means for increasing or decreasing the combination with means for causing a magnetic pressure upon such articles, as described.

6. An apparatus for electric welding, consisting of a primary coil fed by alternating currents, means for regulating the effect of said currents upon the secondary coil to inductive relation thereto, means for holding the pieces to be joined, so as to be united with each other at the point of location, and means for pressing said pieces together at the point of location, as described.

Signed at New York, in the County of New York and State of New York, this 10th day of March, A. D. 1888.

WITNESSES.

W. C. Woodward,
J. H. Edwards.

(No Model.)

4 Sheets—Sheet 1.

N. DE BENARDOS & S. OLSZEWSKI.
PROCESS OF AND APPARATUS FOR WORKING METALS BY THE DIRECT
APPLICATION OF THE ELECTRIC CURRENT.
 No. 363,320. Patented May 17, 1887.

FIG. 1.

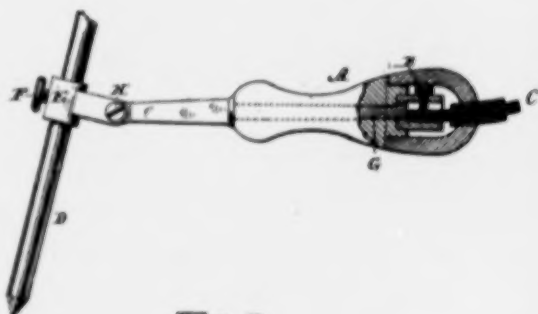
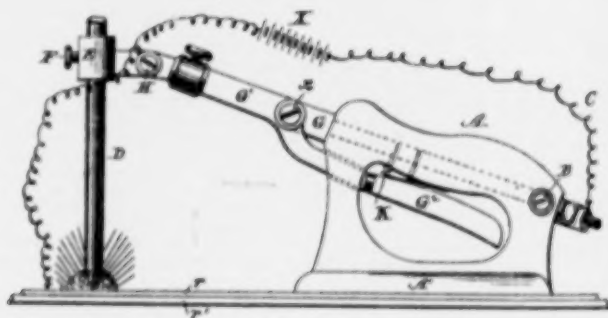


FIG. 2.



Witnesses—
E. L. L. L.
M. H. A. G. L.

Inventors—
Nicholas de Benardos
& Stanislas Olszewski
by M. H. A. G. L.

(No Model.)

4 Sheets—Sheet 2.

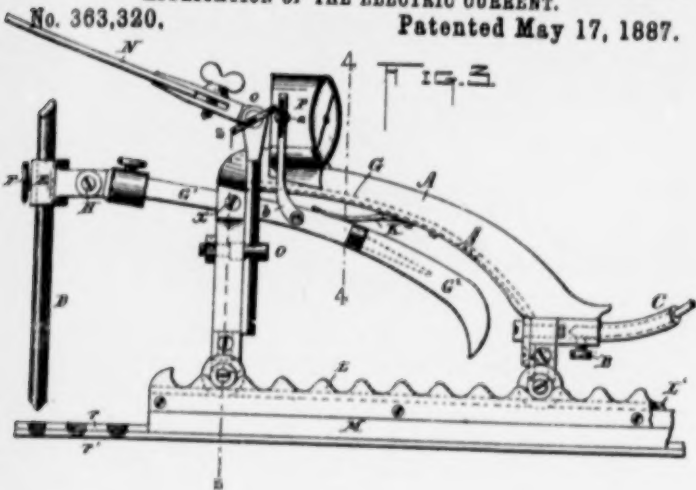
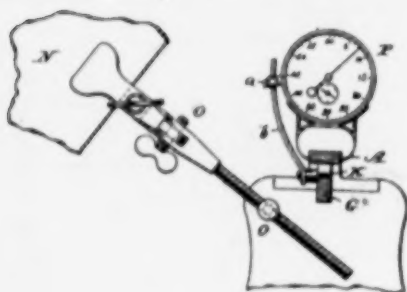
N. DE BENARDOS & S. OLSZEWSKI.**PROCESS OF AND APPARATUS FOR WORKING METALS BY THE DIRECT APPLICATION OF THE ELECTRIC CURRENT.****No. 363,320.****Patented May 17, 1887.**

Fig. 4.



Witnesses—

Wm. A. S. S. S.
Wm. A. S. S. S.
Wm. A. S. S. S.

Inventors—

Nicholas de Benardos
& Stanislas Olszewski
by Manuel S. Bailey
attorney

(No Model.)

4 Sheets—Sheet 3.

N. DE BENARDOS & S. OLSZEWSKI.
 PROCESS OF AND APPARATUS FOR WORKING METALS BY THE DIRECT
 APPLICATION OF THE ELECTRIC CURRENT.

No. 363,320.

Patented May 17, 1887.

FIG. 5.

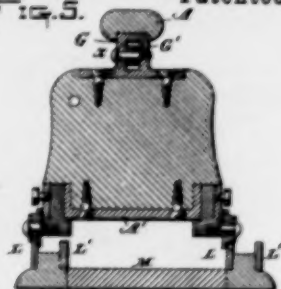


FIG. 6.

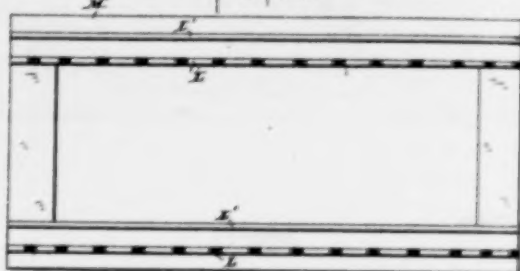
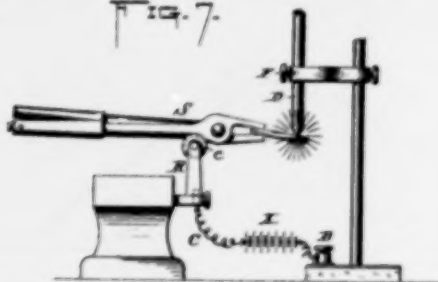


FIG. 7.



Witnesses—
Edw. A. Dick
Martin A. Curtis

Inventors—
Nicholas de Benardos
& Stanislas Olszewski
 by *Manuel P. Bailey*
Attorney

(No Model.)

4 Sheets—Sheet 4.

N. DE BENARDOS & S. OLSZEWSKI.**PROCESS OF AND APPARATUS FOR WORKING METALS BY THE DIRECT APPLICATION OF THE ELECTRIC CURRENT.**

No 363,320.

Patented May 17, 1887.

Fig. 8.



Fig. 9.



Fig. 10.

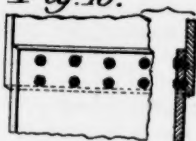


Fig. 11.



Fig. 12.



Fig. 13.

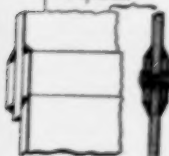


Fig. 15.

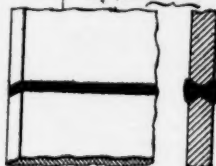


Fig. 14.



Fig. 16.

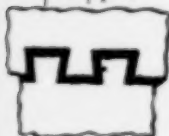


Fig. 17.

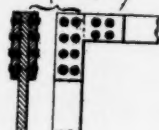


Fig. 18.

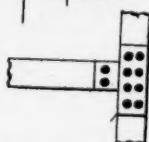


Fig. 19.

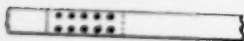


Fig. 20.

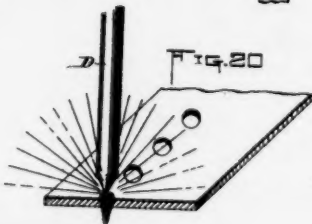


Fig. 21.



Inventors.

Nicholas de Benardos
 & Stanislas Olszewski
 by Marshall S. Bailey
 Attorney

UNITED STATES PATENT OFFICE.

NICHOLAS DE BENARDOS AND STANISLAS OLSZEWSKI, OF ST. PETERSBURG, RUSSIA.

PROCESS OF AND APPARATUS FOR WORKING METALS BY THE DIRECT APPLICATION OF THE ELECTRIC CURRENT.

SPECIFICATION forming part of Letters Patent No. 363,320, dated May 17, 1887.

Application filed December 3, 1885. Serial No. 184,375. (No model.) Patented in France October 18, 1885, No. 171,586; in Belgium October 20, 1885, No. 70,569; in England October 21, 1885, No. 13,044; in Germany November 1, 1885, No. 38,011; in Sweden November 5, 1885, No. 726; in Russia December 31, 1886, No. 11,982, and in Spain January 5, 1887, No. 10,267.

To all whom it may concern:

Be it known that we, NICHOLAS DE BENARDOS and STANISLAS OLSZEWSKI, of St. Petersburg, in the Empire of Russia, have invented certain new and useful Improvements in the Process of and Apparatus for Working Metals by the Direct Application of the Electric Current, (for which we have obtained patents as follows: in France, No. 171,596, dated October 10, 1885; in Belgium, No. 70,569, dated October 20, 1885; in England, No. 12,984, dated October 21, 1885; in Russia, No. 11,982, dated December 31, 1886; in Sweden, No. 726, dated November 6, 1885; in Spain, No. 10,267, dated January 5, 1887, and in Germany, No. 38,011, dated November 1, 1885,) of which the following is a specification.

Our invention contemplates the formation or production of the voltaic arc between the metal to be operated on and a conductor which is brought for said purpose into proper proximity to that point on the metal which is to be operated on, the conductor forming one pole, while the metal to be worked constitutes in itself the other pole. In other words, the metal to be worked and the conductor extraneous to said metal constitute two electrodes or terminals, by the approach of which to each other the circuit in which both are included can be completed through the voltaic arc produced between them. It is this feature which mainly characterizes our invention, and which differentiates it from other methods which have been proposed of working or melting metals by the electric current.

The advantages attending our invention are, briefly stated, its simplicity and efficiency, as well as its wide range of application in the industrial arts.

The only apparatus needed to put this invention into practice outside of the electrical generator or source of electric supply, and the circuit leading therefrom to the metal to be worked and to the extraneous conductor, is a holder for the said conductor, the holder and the metal to be operated on being so arranged as to be movable relatively to each

other, so as to bring the conductor opposite to any desired point on the metal. We prefer, usually, to move the conductor-holder over the metal. The conductor preferably consists of a stick or cylindrical rod of carbon. The form and material of said conductor, however, are not essential features.

In the accompanying drawings we have shown some forms of apparatus, which we will now proceed to describe, in order to more fully explain the manner in which our process can be practically applied.

Figure 1 is a side elevation, partly in section, of a simple form of carbon-holder. Fig. 2 is a like view of a holder adapted to rest upon and be moved over the face of the metal plate or plates which are to be operated on. Fig. 3 is a side elevation of a modified form of apparatus. Fig. 4 is a section on line 4 4, Fig. 3. Fig. 5 is a section on line 5 5, Fig. 3. Fig. 6 is a plan of the rails on which the holder shown in Fig. 3 is mounted. Fig. 7 is a side elevation of a form of apparatus in which the carbon is stationary and the metal to be operated on is movable under the carbon. Figs. 8 to 21 represent various applications of the invention or uses to which it may be put.

The holder shown in Fig. 1 consists of a wooden or other non-conducting handle, A, having in its rear end a socket and binding-screw, B, electrically connected to the conducting stem or shank G, to which is jointed or hinged at H a sleeve, E, containing the carbon pencil D, held in place therein by clamp-screw F. The binding-screw B serves to hold in place the metallic conductor C, which leads from one pole (usually and preferably the + pole) of the source of electricity. The other pole of said source of electricity is connected to the metal to be operated on. When the carbon D, under these conditions, is brought into proximity to the metal to be operated on, the voltaic arc will be produced between the two, with the effect of heating, softening, and finally melting the metal at the point where the arc meets it. The holder can be moved over the metal from one point to another to

set on it in a continuous line, or at separate points, as desired.

The apparatus shown in operation in Fig. 2 consists, also, of a wooden handle, A, with a metallic socket and binding-screw, B, at its rear end, metallic shank G, jointed sleeve E, clamp-screw F, and carbon pencil D, as in the preceding figure. Handle A has a flat base, A', which rests upon and can move over the two metal plates r r' to be operated on. The conductor C for the carbon leads from the + pole of battery X, (typical of any source of electricity, such as accumulator, battery, or dynamo,) and the other pole of said battery is electrically connected to said plates r r' , as shown.

The stem G is a two-part stem jointed together at x , and its front end, G', is continued back of the joint in the form of a lever, G'', which extends under the handle A. A spring, K, keeps the part G', and consequently the carbon D, lifted, thus maintaining a normally open circuit. By pressing lever G' toward the handle the carbon can be lowered into proper proximity to the plates r r' to produce between it and them the voltaic arc. In this figure the apparatus is shown in operation uniting the two plates by a process akin to riveting. By the action of the voltaic arc the metal is gradually melted, the fusion extending through into both plates, the melted portions of which are mingled together, so that when the same cool the two plates, as to said fused portions, are virtually in one homogeneous piece.

The apparatus shown in Figs. 3, 4, 5 in the main resembles that illustrated in Fig. 2. Its base is provided with front and rear pairs of flanged wheels, which run upon either one of two pairs of rails, L L', on a track-frame, M. The rails L are cogged or toothed, as shown, and are designed to be used when the holder is employed for what may be termed "point-union"—that is to say, for operating on the metal at points whose distances from one another will be equal to the distance intervening between the teeth of the rails. The other rails, L', are ordinary straight smooth rails, and are to be used when the holder is employed for uninterrupted or continuous union. This holder is provided with a screen, N, of colored glass, attached to the holder by a universal joint at O, which will permit it to be set in any position required, in order to shield the eyes of the operator from the injurious effects of the voltaic arc. It is also provided with a secondometer or other suitable time-piece, P, having a stop-lever, a , connected to and arranged to be operated by an arm, b , attached to the handle end of vibratory stem G. Normally the handle end G' is depressed by its spring, thus lifting the carbon and breaking the circuit, and the parts are so adjusted that in this position the arm b will bring the stop lever to position to stop the time-piece. When, however, the handle is pressed upward,

thus bringing the carbon into action, the stop-lever will be moved in a direction to permit the time-piece to start. In this way the duration of the operation, in the case of point-union particularly, can be accurately determined.

It will be of course understood that, instead of connecting the wire from one pole of the battery directly to the metal to be operated on, it can be connected to a metallic plate or stand, which serves as a working-bench to support the metal operated on, the two being of course in electrical contact. Such arrangement is represented in Fig. 7, the apparatus being designed for use as a forge. The stand R is furnished with a grooved guide-pulley, c , which receives and supports the metal tangs or shanks of pinchers S, whose handles are sheathed with wood or other insulating material. The pinchers are in electrical contact with the metal pulley, over which they can move to bring the article held by them (in this instance supposed to be a chain-link) under the carbon, which is supported in a stationary holder. The circuit-connections are the same in the other figures. The metal to be operated on can in this apparatus be heated to the desired extent, and then can be transferred to the usual anvil and forged in the customary way.

Our invention, as hereinbefore indicated, is susceptible of a wide range of application. It can be used, for instance, for joining metals whether end to end or placed one on top of the other, for making holes in metal, or for dividing a piece of metal into two or more parts, for steelifying, and for numerous other purposes.

Figs. 8 to 19 represent some of the ways in which metals may be joined by our invention. These figures require no explanation, further than to say that the darkened points or lines in them indicate where the metal has been operated on.

Fig. 20 illustrates the manner in which holes may be bored in metals.

Fig. 21 represents a metallic plate having pattern of fused metal incrustated thereon. The plate is heated to the temperature of fusion at the point where the extraneous metal is to be applied, and said metal in fused condition is dropped upon the heated point or points, thus forming a metal incrustation, which enters and becomes part of the plate. In this way we can incorporate into the plate other metals, granite, porcelain, &c.

From the foregoing it will be observed that the essence of our invention is that the metal itself at the point where it is operated on becomes one pole of the voltaic arc, while the carbon or other extraneous conductor approached thereto constitutes the other pole.

Having now described our invention and the best way at present known to us of carrying the same into effect, what we claim, and desire to secure by Letters Patent, is as follows:

1. The improvement in the art of joining or

separating metals by means of the directly-applied electric current, which consists in forming the voltaic arc at the desired point or points, or along the desired line or lines, on said metal by a conductor approached thereto, which constitutes one pole, while the metal itself constitutes the other pole, as and for the purposes hereinbefore set forth.

2. The process of topically working plates, blocks, or other solid masses of metal, which consists in forming the voltaic arc at those points only of the metal which are to be worked, (leaving the other portions of the same unaffected,) through the agency of an extraneous conductor, which constitutes one pole, while the metal itself constitutes the other pole, as and for the purposes hereinbefore set forth.

3. The carbon-carriage consisting of a frame adapted to rest on and move over the face of the metal to be worked, a carbon or other con-

ductor, a holder therefor carried by said frame and movable to and from the metal on which the frame rests, and means whereby said holder can be actuated, at will, to cause the carbon to approach or recede from the said metal, substantially as hereinbefore set forth.

4. The combination of the supporting-frame, the carbon-holder carried by and movable and adjustable on said frame, and the time-piece connected with and operated by said holder at the times and in the manner substantially as and for the purposes hereinbefore set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

NICHOLAS DE BENARDOS.
STANISLAS OLSZEWSKI.

Witnesses:

NICHOLAS TSCHERKALOFF.
FREDERICK KAUPF.

(No Model.)

E. THOMSON.

METHOD OF ELECTRIC RIVETING.

No. 396,015.

Patented Jan. 8, 1889.

Fig. 1.

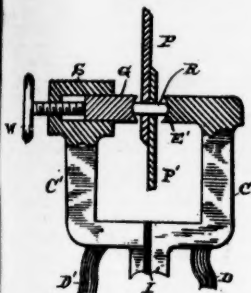


Fig. 2.

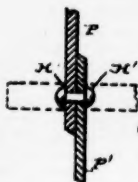


Fig. 3.



Fig. 4.

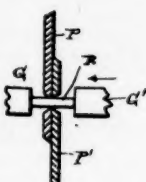


Fig. 5.



Fig. 6.



Fig. 7.



Fig. 8.



Fig. 9.

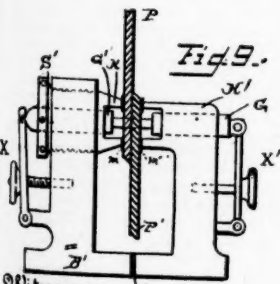
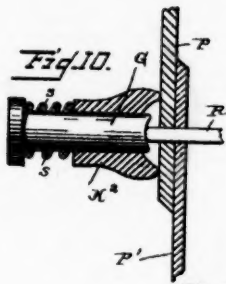


Fig. 10.



Witnesses.
J. P. Steward
H. C. Capel

Inventor
Elihu Thomson

By His Attorney

H. C. Townsend

UNITED STATES PATENT OFFICE.

ELIHU THOMSON, OF LYNN, MASSACHUSETTS.

METHOD OF ELECTRIC RIVETING.

SPECIFICATION forming part of Letters Patent No. 396,015, dated January 8, 1889.

Application filed October 12, 1888. Serial No. 287,010. (No model.)

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, and a resident of Lynn, in the county of Essex and State of Massachusetts, have invented a certain new and useful Improved Method of Electric Riveting, of which the following is a specification.

My invention consists, essentially, in a method of riveting by placing the rivet or rivet-blank in position in the socket or hole designed to receive it, passing through said rivet an electric current of sufficient volume to heat the same to the requisite temperature, and then setting the rivet in its position by endwise pressure or other means employed in ordinary riveting operations.

In carrying out my invention I may swage or form both heads after the heating of the rivet-blank in position in the work, or may swage or form one head only, the rivet having been inserted with one head ready formed. The heating of the rivet when in position may be carried only to the point sufficient to permit it to be set by swaging or heading its ends, or the current may be allowed to pass for a longer period and until the central portion of the rivet, as well as the metal near thereto, is raised to a welding temperature, when the application of pressure expanding the rivet in its seat will weld the same to the metal surrounding it, and the application of pressure to the pieces to be riveted will weld them together around the rivet. In some cases I may cause the electric current to flow across from piece to piece of the parts to be riveted, as well as through the rivet itself.

Detail processes forming a part of my invention will be more particularly specified in the claims.

In the accompanying drawings, forming a part of this specification, Figure 1 is a side elevation and partial section of a form of apparatus suitable for carrying out my method of electric riveting. Fig. 2 is a view of the rivet after the operation has been effected. Figs. 3 and 4 illustrate modifications in the manner of practicing the invention. Figs. 5, 6, 7, and 8 are illustrations of the work accomplished. Fig. 9 is a side elevation of an improved form of apparatus which may be used in practicing my present invention. Fig. 10 shows a further modification.

In Fig. 1, P, P' indicate two plates of metal—such as boiler or sheet metal—to be secured together by means of a rivet placed in a hole passing through lapped portions of the plates.

C, C' indicate two blocks or pieces of material adapted to conduct an electric current and made sufficiently massive to permit the current of large volume required in the operation to pass without becoming unduly heated.

The electric current required is conveyed from any source—such, for instance, as that described in my previous patent, No. 347,140—to the blocks C, C' by means of cables D, D' , or by other means, and the blocks are insulated from one another, as indicated at I , in order to prevent the current of the cables from short-circuiting around the work. Supported upon the head S of the block C' , and in electrical connection therewith, is a plunger G , whose end is of the nature of a swaging tool or die, and which may be forced against the work by means of a screw, W . Formed upon or attached to the block C , and in electrical connection with the source of current, is another receiving block or anvil, E' , for one end of the rivet. The faces or ends of the blocks G, E' are in line with one another, and are adapted to receive the rivet R between them. The contour of their swaging, forming, or holding ends may be considerably varied, according to the special manner of securing the rivet in place which it is desired to employ. In the form shown in Fig. 1 the end of G is made concave to receive and fit over the end of the rivet-blank and to operate as a means of swaging a head upon the rivet-blank. The other block, E' , is similarly formed for a similar purpose.

In employing the apparatus described the blocks or pieces G, E' are brought to bear upon the rivet or rivet-blank R , which has been previously inserted into the hole through the plates, the ends of said blocks receiving the ends of the rivet or rivet-blank between them. Electric current is now turned on and made to pass through the rivet or blank in sufficient volume to heat the rivet to a softened condition, after which endwise pressure or other force is applied through the plunger G —as, for instance, by means of screw W . This will firmly seat and expand the rivet in

its hole, and will at the same time form heads at opposite ends of the rivet-blank, or at one end thereof only, if, as indicated in Fig. 3, a rivet with a head already formed has been inserted into the hole previously to the riveting operation.

Fig. 2 illustrates the condition of things at the completion of the operation, the rivet being there shown as set.

In Fig. 3 the rivet is shown as having one head formed on it before being inserted into the hole bored or punched for the purpose. The other head is formed at E' by the movement of the clamping piece or plunger G' after the current has heated the metal to the desired temperature.

Fig. 4 simply illustrates the fact that two plungers, G G', might be employed and moved in opposite directions, or toward the rivet-blank R after the blank is sufficiently heated. This figure also shows that the holes punched or bored in the plates may be countersunk, so that the riveted heads may not protrude from the plates.

Fig. 5 shows two plates riveted in this manner, the rivet fitting solidly into the countersunk holes, as shown at h h'.

A valuable effect, (illustrated in Fig. 6,) not possible in other processes, may be obtained by my method of riveting by continuing the heating of the rivet-blank placed in the hole for some moments longer than is necessary to raise it to a softening temperature. By continuation the heat is carried to the portions of the plate surrounding the rivet, raising such portions to a welding temperature, and when the rivet is pushed firmly into the hole a partial welding of the rivet to the sides of the hole is effected, thus forming practically solid metal for a portion of the distance from it to d'.

Fig. 7 shows a similar effect, which occurs when the rivet-heads are not forced into countersunk holes, but are allowed to protrude from the plates.

Fig. 8 shows a modification where one head of the rivet is allowed to protrude from the plate, the other end fitting solidly and evenly into the countersunk hole bored to receive it.

Fig. 9 shows a modified form of apparatus which is found useful in carrying out my improved method of electric riveting, and which is an improvement over that of Fig. 1, inasmuch as it can be used to force the plates together before the current is put on and keep them together while the rivet is heated and forced in place. K K' are heavy clamping-pieces having a common bed or support, B, and one or both provided with a screw, S'. By means of screw S' the clamping device K K' may be forced hard against the plates P P', as shown in the figure, thus making a firm contact where the metals are lapped over each other.

The plungers or formers G G' are mounted on the clamp-heads, and are operated by means

of the screw-nuts X X' bearing upon levers connected to the plungers. By the use of this form of apparatus a heating electric current might be passed through the metal plates themselves at parts around the rivet by means of the pressure pieces or clamps K K'. Such current would assist in raising the portion of the plates immediately surrounding the rivet to the welding temperature; but the prime object is that through the application of the pressure the plates themselves may be held together during the riveting. The blocks K' K may therefore be faced with mica or other insulator, m m'.

Fig. 10 shows a modification of the just-described apparatus. It is one of the plungers which is used to convey the current to the rivet R. K² is a heavy piece of metal, so arranged as to press against the plates P P'. Pressure is applied to piece K² from the plunger by the springs s s.

It will be seen that by my improved method of electric riveting a large amount of labor is overcome and much time is saved. The heating of the rivet can be accomplished in a very few seconds, the time depending on the power of the electric apparatus supplying the current. It is also obvious that the inconvenience of transporting hot rivets from the forge to the hole in the boiler or other plates is avoided in my present invention. The superior advantage, also, of partially welding the rivet to the plate is obvious.

I have described some of the forms of apparatus that may be used for carrying out my invention; but it will be readily understood that the same method might be practiced by using other devices.

While I have described the riveting of the blank after heating as being performed by means of the blocks through which current is applied to the rivet or blank, it is obvious that the invention might be practiced by withdrawing said blocks after the rivet has been heated to the desired degree, or by applying the current through any other means, and then heading the rivets by any desired means.

I have not herein claimed the apparatus described, as my present patent is for the novel art or process, whether practiced by means of the apparatus described or any other suitable apparatus.

What I claim as my invention is—

1. The herein-described improved method of riveting, consisting in heating the rivet or rivet-blank electrically while in place, and then heading either or both ends of the same.

2. The herein-described method or process of riveting, consisting in making the rivet while in position a portion of a circuit carrying a heating or large volume of electric current, and then setting the rivet by any desired means, as and for the purpose described.

3. The herein-described method of riveting, consisting in passing a heavy electric current through the rivet or rivet-blank while the

same is in position, and then applying end-pressure to the rivet to set the same.

4. The herein-described method of riveting, consisting in applying to opposite ends of the rivet while in position suitable metal blocks or pieces, either or both movable, including said blocks and rivet in an electric circuit carrying an electric current of large volume for the purpose of heating the rivet, and then forcing said blocks or pieces toward one another to set the rivet.

5. The herein-described method of riveting, consisting in heating the rivet while in place by an electric current until it assumes a welding temperature, and then applying pressure to set the rivet in its seat and unite the sides of the same to the metal body through which it passes.

6. The herein-described method of fastening two pieces of metal together, consisting

in passing a heating electric current through a rivet or rivet-blank, passing through the pieces as well as through the pieces of metal themselves in the neighborhood of the rivet and applying pressure to set the rivet and weld the pieces together.

7. The herein-described method of electric riveting, consisting in pressing the plates together, heating the rivet inserted through the plates by a heavy electric current flowing through the same; and applying end-pressure to the rivet to head or set the same.

Signed at Lynn, in the county of Essex and State of Massachusetts, this 10th day of October, A. D. 1888.

ELIHU THOMSON.

Witnesses:

CHARLES G. STONE,
OTIS K. STUART.

(No Model.)

M. W. DEWEY.
METHOD OF ELECTRIC RIVETING.

No. 432,727.

Patented July 22, 1890.

Fig. 1.

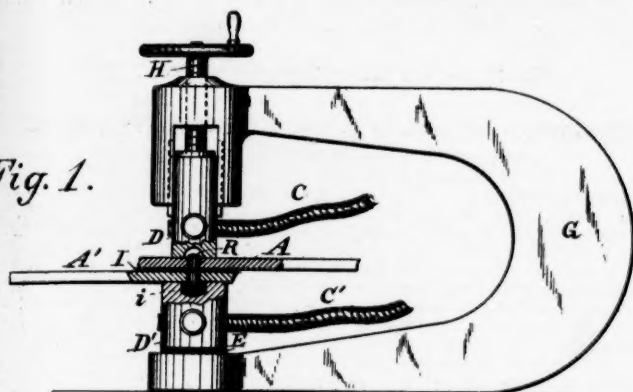


Fig. 2.

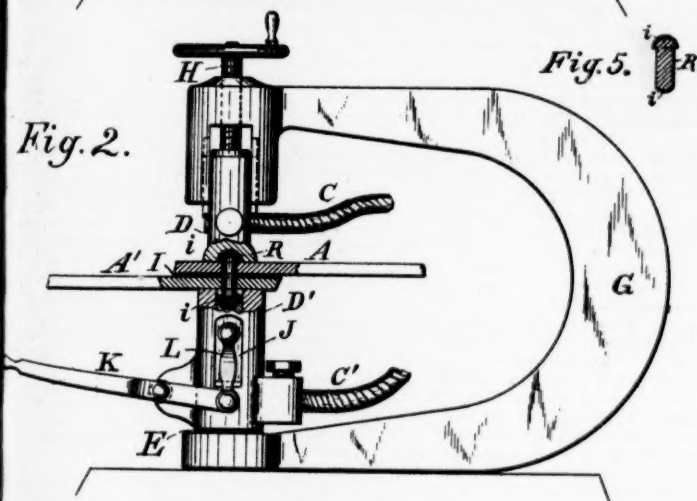


Fig. 5.



WITNESSES:

C. L. Bondeson
J. J. Laessle



Fig. 3.



Fig. 4.

INVENTOR:

Mark W. Dewey
BY
Shull, Laessle & Shull
ATTORNEYS

UNITED STATES PATENT OFFICE.

MARK W. DEWEY, OF SYRACUSE, NEW YORK, ASSIGNOR TO THE DEWEY CORPORATION, OF SAME PLACE.

METHOD OF ELECTRIC RIVETING.

SPECIFICATION forming part of Letters Patent No. 403,787, dated July 22, 1908.

Application filed April 24, 1905. Serial No. 244,375. (No model.)

To all whom it may concern:

Be it known that I, MARK W. DEWEY, of Syracuse, in the county of Onondaga, in the State of New York, have invented new and useful Improvements in Method of Electric Riveting, (Case No. 57,) of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

My invention relates to electric riveting, and is a method or process consisting, essentially, in interposing insulating material between the plates or plates to be riveted together, then inserting the rivet into the rivet hole or holes, and then passing a heating electric current through and between the plates and rivet.

The object of my invention is to confine the current in its passage between the metal blocks or riveting tools forming the terminals of an electric circuit to the rivet and metal body through which it passes, or, in other words, to direct or guide the current in a certain path through the work that will tend to produce more effective and economical results than heretofore.

In the usual methods of electric riveting heretofore employed the metal plates or plates to be riveted together were laid one upon the other without insulating material between them, and then punctured or drilled and the metallic rivet inserted in the rivet hole or holes. The metal blocks or terminals of an electric circuit were then brought into contact with the ends of the rivet and the current allowed to pass through said rivet and plates until the ends of the rivet were sufficiently softened, when it was cut by pressure applied to its ends to form heads. The rivet was in direct contact with the electric terminals, and also with the plates through which it extended, and the current in its passage between the terminals naturally expanded and divided when it reached the plates, except at the projecting ends of the rivet in contact with the terminals. The ends alone of the rivet, therefore, were sufficiently heated, and the portion of the steel sheet within the holes in the plates remained comparatively cool, so it remained but a small part of the current and did not become properly welded or united to the walls of the rivet

hole. Consequently it was very common to form heads on the ends of the rivet by pressure in order to secure the plates together. It will be seen that a large part of the current was wasted by this method, especially when it was desired to unite the ends of the steel to the metal body through which it passed, as the current had to pass through the work a long time. It is essential that the riveting operation be done as quickly as possible; otherwise, as the plates have usually good reflecting surface and good conductivity, the heated will be rapidly dissipated and wasted.

It will be apparent from the above that heretofore an electric riveting operation depended largely upon the resistance offered by the ends of the rivet, so the portion within the hole, with the metal body surrounding and in contact with it, formed a path to the current of very low resistance, which became heated, if heated at all, only by the induction of heat from the highly-heated ends of the rivet. By my improved method I confine the current passing between the metal blocks, forming the terminals of the circuit, to a path of high resistance, so that the rivet-head within the hole and the walls of the hole as both acted to a walling-temperature and singularly heated. The resistance of the steel sheet and the metal body surrounding it, produced by the loss of the current, is alone sufficient to effect the union of the plates without pressure of any kind. Nevertheless, if desired, extrinsic pressure may be applied also, as when a heating operation is desired. A heating operation is not necessary, either process, as the steel is finally united to the metal body or plates throughout its length and they become one piece, thus saving all heating and consolidating.

It has been proposed, in order to confine the current to the rivet, to cover the rivet-shank with insulating material, but this merely prevents the action of the steel with the metal body, and the plates are fast together only by the steel head, which is dissipated and cold.

In practicing my improved process I heat the surface of one of the plates in an extrinsic manner in all previous electric riveting

is in contact with the other plates, including material such as an external circuit, and, or an anode, or an cathode. Thus the rod 2 is connected to the other plates, and the terminals of the electric circuit are brought in contact with the back sides of the plates, preferably at points near and surrounding the ends of the rods, which have an insulator from each terminal in any direction. By this arrangement the current is passed from one of the terminals or metal blocks building up around the plates together into one of the plates in the vicinity of the rods from the other plates toward through the rods to the other plates, and then from the latter plates to the vicinity of each rod to the other terminal or metal block. The metal may be practical by means of copper wires connected to these rods and connections and different from those shown to the drawings, although this is sufficient for carrying out my method.

In the accompanying drawings, Figure 1 represents a method of operation for creating an electric field, and Fig. 2 is another form of a modified electric pressure is applied to the ends of the rods. Fig. 3 is a modified view of the plates and rods after the operation has been effected. Fig. 4 is a modified view of the plates after the insulating material has been applied and the holes drilled, but before the plates are placed together and the rods inserted in position; and Fig. 5 is a method of electrically insulating material or in contact with the plates of influence indicates corresponding parts.

Referring now more specifically to the drawings, A and B' indicate two metal plates to be secured together by means of a rod 2, placed in a hole or holes running through corresponding portions of the plates having insulating material 1 between them, and 3 and 3' indicate two metal blocks or terminals of a suitable electric circuit and of sufficient size to conduct a current of large volume without becoming greatly heated thereby.

The insulating material employed may be derived from any suitable source or may be the same as that described in my prior patent, No. 2,071,141, dated April 21, 1935. The current is conveyed by means of sections of good conductivity 4 and 4' in the blocks 3 and 3', which are insulated one from the other as shown at 5, to prevent the current from circulating around the rods. The metal block 3 is the shape of a plug or is supported by the end of the upper arm of the frame 6 and may be raised and lowered upon the rods as shown by means of the screw 7. The block 3' is continuous, from its level, is connected with the other 4', and is fixed to the frame 6 from the end of the lower arm of the frame. The insulating material between 3 and 3' are provided to and opposite each other, as 8 is movable toward and from block 3'. After the plates are placed in

position to operate and the rods inserted the upper block 3 is moved down by means of the screw 7 until plates are held in position close together and in contact with each other, thereby creating an electric circuit with the same. This operation block 3 is followed out on the insulating material, so that it does not come in contact with the end of the rods and the metal block is also followed out to a distance away from the connections the latter is the block is easily separated from with some of the material insulating material. In Fig. 2 the same block 3 is also shown after with the same material. When the rods are in position the current is allowed to flow and as a result of the insulation between the plates and the insulation on the ends of the rods the current is passed through the plates and rods, thus an electric circuit, allowing a large amount of current to the ends of the rods in the plates or metal blocks surrounding it, as shown in Fig. 3. When 3 is moved to its position, the rods are held together, as shown in Fig. 3 of the drawings, by means of a screw 7, which is used to hold the rods together by a lock 11. By increasing the force of the rods of the plates 3 is fixed and pressure is applied to the end of the rods to create a force between the plates and the ends of the rods. The insulating material of the plates may be under with the insulating material 1, but if used from a metal or metal block in Fig. 3 it will be sufficient to the purpose of my invention.

It will be derived that an electric circuit is created between the plates and the rods, and current passes through the rods and plates, if heated and with good connections the insulating material is separated between the plates. Instead of using a rod with holes and plates having holes, as in the block shown in 3 is fixed to the frame 6 with the end of the rods having the same, then the ends of the rods are in contact or covered with suitable insulating material, as shown in Fig. 4.

Having described my invention, what I claim as new and desire to secure by patent is:

1. The device described, consisting of a pair of electric plates, consisting of insulating material between the plates, a rod 2, placed in a hole or holes running through corresponding portions of the plates having insulating material 1 between them, and 3 and 3' indicate two metal blocks or terminals of a suitable electric circuit and of sufficient size to conduct a current of large volume without becoming greatly heated thereby.

2. The device described, consisting of a pair of electric plates, consisting of insulating material between the plates, a rod 2, placed in a hole or holes running through corresponding portions of the plates having insulating material 1 between them, and 3 and 3' indicate two metal blocks or terminals of a suitable electric circuit and of sufficient size to conduct a current of large volume without becoming greatly heated thereby.

other plate, and then from the latter plate in the vicinity of said rivet to unite the sides of the same to the metal body through which it passes.

3. The herein-described method of electric riveting, consisting in interposing insulating material between the plates, pressing the same together and heating the rivet inserted through the plates by a heavy electric current flowing through the rivet and plates to unite the sides of the rivet to the metal body through which it passes.

4. The herein-described method of electric riveting, consisting in interposing insulating material between the plates, pressing the same together, and heating the rivet inserted through the plates by a heavy electric current flowing through the rivet and plates to unite the sides of the rivet to the metal body through which it passes, and then applying pressure to perfect the union, as desired.

5. The herein-described method of electric riveting, consisting in interposing insulating material between the plates, pressing the same together, heating the rivet inserted through the plates by a heavy electric current flowing through the rivet and plates to unite the sides of the rivet to the metal body through which it passes, and then applying end pressure to the rivet to perfect the union of said parts.

6. The herein-described method or process of riveting, consisting in interposing insulating material between the plates and heating the rivet and plates electrically while in position to weld or unite the sides of the rivet to the metal body through which it passes.

7. The herein-described method or process of riveting, consisting in interposing insulating material between the pieces or plates to be riveted together, then inserting the rivet into the rivet hole or holes, insulating the ends of the rivet, then passing a heating electric current into one of the plates in the vicinity of the rivet from the said plate to and through the rivet to the other plate, and then from the latter plate in the vicinity of said

rivet, to unite the sides of the same to the metal body through which it passes.

8. The herein-described method or process of riveting, consisting in interposing insulating material between the pieces or plates to be riveted together, then inserting the rivet into the rivet hole or holes, holding the plates together by applying metal blocks on each side, insulating the ends of the rivet from the blocks, then passing a heating electric current into one of the plates in the vicinity of the rivet from the said plate to and through the rivet to the other plate, and then from the latter plate in the vicinity of said rivet, to unite the sides of the same to the metal body through which it passes.

9. The herein-described method or process of riveting, consisting in interposing insulating material between the pieces or plates to be riveted together, then inserting the rivet into the rivet hole or holes, holding the plates together by applying metal blocks on each side, insulating the ends of the rivet from the blocks, then passing a heating electric current into one of the plates in the vicinity of the rivet from the said plate to and through the rivet to the other plate, and then from the latter plate in the vicinity of said rivet, to unite the sides of the same to the metal body through which it passes, and then applying pressure to perfect the union, as desired.

10. The herein-described method or process of riveting, consisting in interposing insulating material between the pieces or plates to be riveted together, then inserting the rivet into the rivet hole or holes, and then passing a heating electric current through and between the plates and rivets, to unite the sides of the same to the metal body through which it passes.

In testimony whereof I have hereunto signed my name this 22d day of April, 1890.

MARK W. DEWEY. [L.S.]

Witnesses:

C. H. DUNELL,

H. M. SEAMANS.

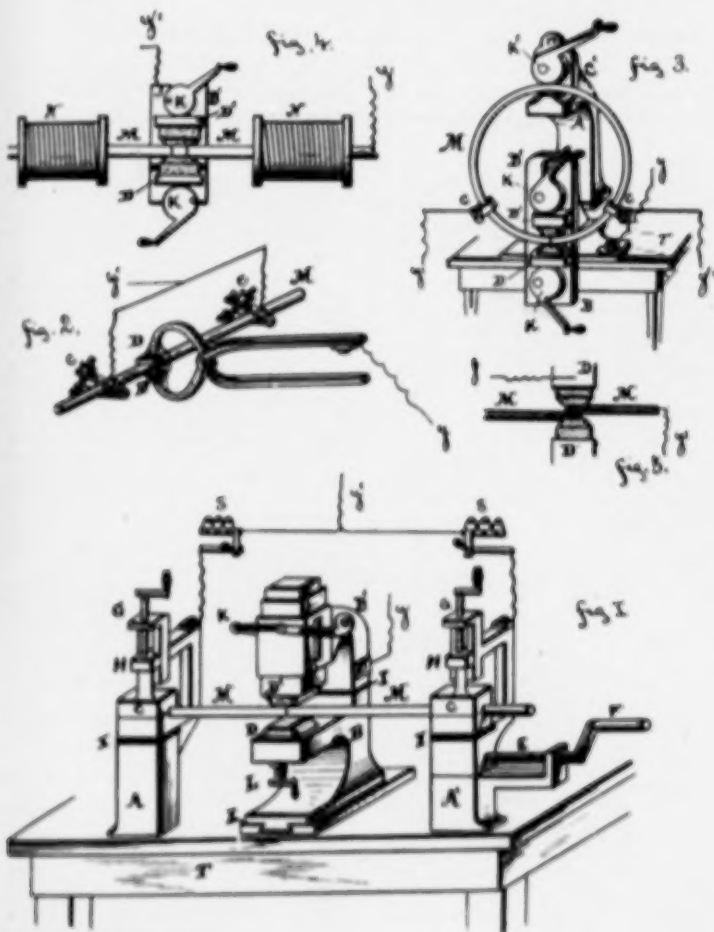
No Model.)

C. L. COFFIN.

PROCESS OF ELECTRICALLY WELDING METALS.

No. 437,571.

Patented Sept. 30, 1890.



Witness:
Amos L. Coffin
John W. Anderson

Inventor.
Charles L. Coffin.

UNITED STATES PATENT OFFICE.

CHARLES L. COFFIN, OF DETROIT, MICHIGAN.

PROCESS OF ELECTRICALLY WELDING METALS.

SPECIFICATION forming part of Letters Patent No. 437,571, dated September 30, 1890.

Application filed April 9, 1890. Serial No. 347,125. (No model.)

To all whom it may concern:

Be it known that I, CHARLES L. COFFIN, of Detroit, in the county of Wayne and State of Michigan, have invented a new and useful Improvement in Process of Electric Welding and Metal-Working, of which the following is a specification.

My invention consists of an improved process of electric welding and metal-working, hereinafter fully described and claimed.

The drawings represent apparatus by which my invention may be practiced. Figures 1, 2, and 3 are perspectives, and Figs. 4 and 5 are partial elevations.

In Fig. 1, T represents a table, upon which are mounted two posts A and A', the upper part of post A' being made movable and controlled by a screw-shaft E, having a crank F. I represents insulation in all the figures. C C represent clamps supported on posts A and A', but insulated therefrom, the upper half of each clamp being movable by means of a winch G and sliding block H or in any other convenient manner. B represents a post, movably mounted on table T, carrying an anvil-block D, preferably of carbon, which is movable vertically by a screw-shaft L. B' represents a post secured to but insulated from table T, which carries a vertically-sliding head K, at the lower end of which is a conductor D', (preferably of carbon.) The post B' is connected by the conductor Y with one pole only of a generator, and the clamps C C are connected by a branched conductor Y', in which there may be resistance-switches S to equalize the resistance of the branches with the other pole of said generator. M M represent the articles to be welded together, which are clamped in the clamps C, and are supported by the anvil D, either in contact, as shown in Figs. 1, 2, and 5, or separated, as shown in Fig. 4.

In the operation of this apparatus, the articles being clamped, as shown in the figures, the conductor D' is brought down to make contact with the articles M M, and a heating-current is then passed through the conductors Y Y', traversing the articles M M and passing out through conductor D', or vice versa, by which the articles M M are heated at their point of contact with the conductor D', when they may be pressed together by the winch E F to form the weld, which may be completed by hammering, rolling, &c.

In Fig. 2 conductor D' and anvil D are both represented by one pair of tongs, which are clamped on the article M at the point where it is desired to heat said article, and the clamps C C are connected with the article M at each side of this point, being both connected by a branched conductor Y' with one pole of a generator, and the tongs D' being connected by the conductor Y with the other pole of said generator.

In Fig. 4 the arrangement is substantially the same as Fig. 1, the conductor D' being raised and lowered by an eccentric K, and a similar eccentric being substituted for the shaft L to lower and raise the anvil D'. In this figure the articles M M pass through hollow magnets N N and are not in contact, one being connected by the conductor Y with one pole only of a generator, and the conductor D' being connected by the conductor Y' with the other pole of the generator, one of the articles M being directly heated by the current and the other heated by radiation.

In Fig. 3 the apparatus of Fig. 4 is shown as applied to welding a hoop, which is held in the upper clamp C, provided with the eccentric K', and the clamps C C, which are connected with the branched conductor Y', are in this case connected with the hoop on opposite sides of the joint.

In Fig. 5 the mechanism of Figs. 3 and 4 is indicated as applied to making a lap-joint between the articles M M.

A description of the operation of Fig. 1 applies to all the figures.

What I claim as my invention, and desire to secure by Letters Patent, is—

The process herein described of welding metals electrically, which consists in bringing the parts to be welded in contact with an anvil, and a conductor, which is connected with one pole of a generator, connecting said articles with the other pole of said generator only, passing a heating-current through the articles and conductor, and pressing the articles together and forming the weld while in contact with said conductor, substantially as set forth.

CHARLES L. COFFIN.

Witnesses:

CYRUS E. LOTHROP,
GERTRUDE H. ANDERSON.

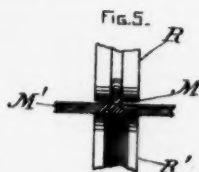
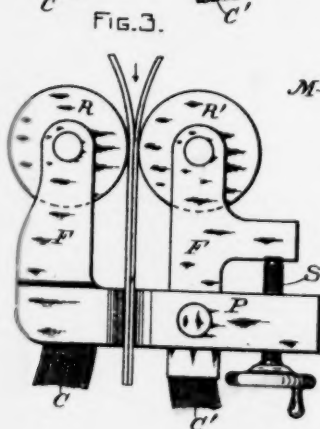
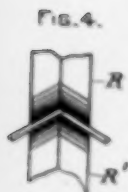
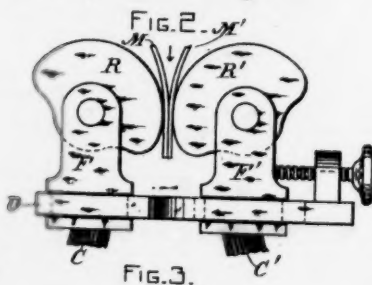
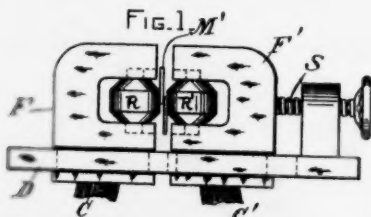
Defendant's Exhibit No. 7

(No Model.)

E. THOMSON.
METHOD OF ELECTRIC WELDING.

No. 444,928.

Patented Jan. 20, 1891.



WITNESSES.
J. H. Mundy
H. C. Capel

INVENTOR.
Elihu Thomson
By H. C. Townsend
Atty

UNITED STATES PATENT OFFICE.

ELIHU THOMSON, OF SWAMPSCOTT, MASSACHUSETTS, ASSIGNOR TO THE THOMSON ELECTRIC WELDING COMPANY, OF MAINE.

METHOD OF ELECTRIC WELDING.

SPECIFICATION forming part of Letters Patent No. 444,928, dated January 20, 1891.

Application filed June 14, 1890. Serial No. 355,602. (No model.)

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, and a resident of Swampscott, in the county of Essex and State of Massachusetts, have invented a certain new and useful Method of Electric Welding, of which the following is a specification.

My invention relates to a process of electric welding in which the surfaces to be welded are pressed together to form a union, and the heating of the surfaces to the desired plasticity is effected by means of an electric current passed across the joint or line of proposed union.

My present invention relates more particularly to the process of joining or welding together strips, sheets, plates, or bars of metal where it is desirable to form a joint of considerable length, and is especially applicable to the welding of plates together at their edges, instead of riveting, to the welding of ribs or strips of metals to plates for the purpose of strengthening the same, to the formation of pipes by welding a longitudinal joint, to the welding of half-round or other shaped strips on one or both sides of a plate or strip of metal, and to other similar classes of work, as will be obvious.

My present invention consists, essentially, of forming an elongated joint by the electric welding process by feeding the work in the longitudinal direction of the joint through suitable pressure devices, the work being properly arranged, so that the pressure devices will press the surfaces to be welded together and simultaneously passing an electric current through the work at the point of pressure.

In carrying out my invention I prefer to use as the pressure devices suitable rolls or segments of rolls which are included in the heating electric circuit and from which the current passes to the work and across the surfaces pressed against one another by such rolls. In combination with the rollers or similar devices I employ any usual or proper means, such as screws, levers, or other devices

for forcing them toward one another. As the work is passed through such rolls with a continuous motion, each point as it comes between the rolls is heated and the surfaces pressed together by the pressure applied in a line transverse to the plane of the surfaces to be welded.

In the accompanying drawings I have illustrated, in Figures 1, 2, and 3, various forms of apparatus suitable for carrying out my invention. Fig. 4 is an edge view of two rolls of special form that may be used in carrying out my invention. Fig. 5 illustrates rolls or pressure devices of a special construction invented by me and hereinafter claimed.

Referring to Fig. 1, R R' indicate two rolls of conducting material, which are mounted in suitable frames F F', and are supported upon but insulated from a bed-plate D. The frames F F', being of conducting material, may be connected with any suitable source of electric current of large volume through cables C C', or by other means, so that an electric current may be caused to pass from one roll to the other, and through any pieces of conducting material held between them in pressure-contact. The frame F' may be made to slide in the bed-plate D and may be forced toward the opposite roll by means of the screw S, so that the desired pressure may be applied. In this figure I have illustrated the application of my invention to the welding of the edges of two plates M M' together, the plates being shown in end view as in position between the rolls ready to be fed between them in the longitudinal direction of such plates. The edges are slightly overlapped, as shown, and the plates, being in position between the rolls, may be squeezed together by means of the screw S, thus forming an electric contact between them. The electric current being now turned on as it passes from one roller to the other and across the point of pressure will heat the work to the welding temperature and soften the same slightly, after which the screw may be given a few more turns to effect a solid union. The work, hav

ing been thus started, may now be moved along through or between the rollers, so as to bring successive parts of the joint into position to be pressed and heated at the same time. By this operation the metal will become thoroughly united as it passes through and out from between the rolls. It is obvious that the speed of the operation may be varied by varying the rate of heating and the rapidity at which the work may be fed through the rolls.

In Fig. 2 I have shown segments of rolls R R' to be employed in special work, as in the joining face to face of two strips or plates M M', which are of comparatively limited length in the direction of the joint. In this case the work is supposed to be fed down vertically through the rollers and through the bed-plate. The length of the strips and of the joint between them is in this instance supposed to be of about the same length as the face of the segment, so that the pieces may be drawn or forced through and the whole length united by the time it has passed between the segments. The frames holding the segments or rolls are mounted as before described in connection with Fig. 1, and current may be supplied to them in the manner indicated, as by cables C C', or in any other desired way. In all cases the work may be fed or passed between the rolls by means of power applied to the rolls or segments, in which case the friction of the rolls on the metal will draw the work through. If desired, power may be applied directly to the metal itself, the latter method being somewhat preferable.

In Fig. 3 an apparatus slightly modified from that of Fig. 1 is illustrated. Here the work is supposed to be fed down vertically through the bed-plate and between the rolls, and the movable frame of the roll R' is a pivoted frame instead of a sliding frame, as in Fig. 1. The point of pivoting is indicated at P. The pressure-screw S is insulated from the frame F' by engaging with a piece of insulating material, as indicated, let into the frame.

It is obvious that a large variety of work may be done by this process. Thus, as indicated in Fig. 4, the method may be applied to the formation of joints between pieces arranged to make V-shaped troughs or plates, the two parts being welded together at an angle, as represented, but the pressure being applied, as in the cases before mentioned, in such way as to press the surfaces to be welded into contact. The face of the roller may obviously be of any suitable form conforming to the ultimate shape of the finished article desired, and may then be used to shape or conform a flat strip or strips of metal into different shapes in cross-section simultaneously with the welding operation. In such instances, however, it would be necessary to

employ a current of somewhat larger volume in order to heat the whole cross-section of the work that is exposed to the surface of the rollers in addition to the parts at or near the joint.

In Fig. 5 I have illustrated apparatus that may be used in welding a strip or rib M to the surface of a plate or strip M' that is wider than said rib or is of a different shape therefrom. The roller rest or abutment R' is made with an insulating face or surface immediately beneath the work or in the line with the smaller piece M, as indicated, but is of conducting material, to one side of such line. The effect of this is to cause the current to take the paths indicated by the arrow, so as to take a path through the surfaces of the strip or plate M' near the edges of the work or joint, thereby causing proper heating and joining of the strip or rib M at its edges as well as at the inner or flat surface thereof.

What I claim as my invention is—

1. The herein-described method of forming an elongated joint by the electric welding process, consisting in feeding the work in the longitudinal direction of the joint through suitable pressure devices while properly arranged, so that the pressure devices will press the surfaces to be welded against one another, and simultaneously passing an electric current through the work at the point of pressure.

2. The herein-described improvement in forming electrically-welded joints, consisting in lapping the pieces to be welded upon one another, passing the lapped pieces through or between suitable pressure devices, forming the electrodes of an electric heating-circuit, and applying pressure to effect the weld.

3. The herein-described improvement in forming longitudinal seams or joints between strips or pieces of metal, consisting in feeding the strips or pieces through suitable rolls while arranged in proper position to be pressed together by such rolls, and at the same time passing a heating electric current from one roll to another and through the surfaces to be welded, as and for the purpose described.

4. The herein-described improvement in electric welding and shaping of metals, consisting in feeding two or more strips of metal to be welded together through forming or shaping rolls in the longitudinal direction of the joint, pressing the surfaces to be welded together by such rolls, and at the same time passing a current from roll to roll of sufficient volume to heat the strips to plasticity, so as to effect the weld and at the same time shape the metal to the desired form in cross-section.

5. In an electric welding apparatus, an abutment or rest for the work, made of insulating material at its surface immediately beneath the parts to be welded and of conducting material to one side of it, so as to cause a cur-

rent to pass or be delivered through surfaces near the edge of the work, as a purpose described.

6. In an electric welding apparatus, a pressure and conducting roll a part of the surface of which is a conductor, while another part is a non-conductor, for the purpose of directing the current through the work under pressure.

Signed at Lynn, in the county of Essex and State of Massachusetts, this 11th day of June, 1890.
A. D. 1890.

ELIHU THOMSON.

Witnesses:

JOHN W. GIBBONEY,
DUGALD MCKILLOP.

(No Model.)

G. W. BLANCHARD.
ELECTRIC HEATING TOOL.

No. 466,266.

Patented Dec. 29, 1891.

Fig. 1.

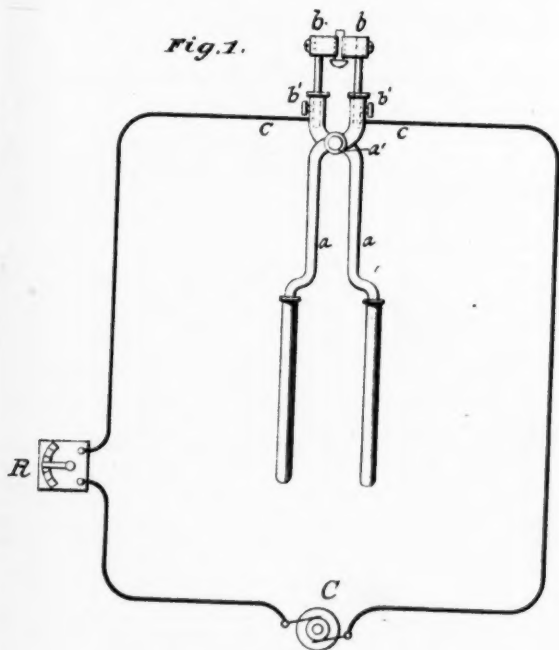
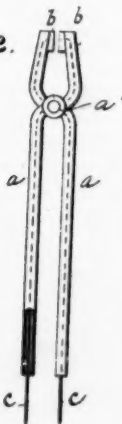


Fig. 2.



WITNESSES:

Edward A. Wagner
H. Mountain

INVENTOR
George W. Blanchard

BY

Attorney

UNITED STATES PATENT OFFICE.

GEORGE W. BLANCHARD, OF WATERTVILLE, MAINE, ASSIGNOR TO THE
ELECTRICAL FORGING COMPANY, OF MAINE.

ELECTRIC HEATING-TOOL.

SPECIFICATION forming part of Letters Patent No. 406,266, dated December 29, 1891.

Application filed April 3, 1891. Serial No. 387,490. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. BLANCHARD, a citizen of the United States, residing in Waterville, in the county of Kennebec and State of Maine, have invented certain new and useful Improvements in Electric Heaters, of which the following is a specification.

This invention has reference to devices for heating articles such as rivets by means of electricity. The primary object of the invention is to produce a device which may be used for heating rivets at locations where it would be inconvenient or impossible to have a forge, and also to provide a new method of handling rivets, whereby the process of riveting is rendered much quicker and the work more effectually accomplished.

The invention consists, first, in the method of heating rivets while the same are in transit from any location to their final place of deposit; and, second, the invention consists of a device similar to tongs, having means for grasping and subjecting a rivet to a heating-current of electricity.

In the accompanying drawings, Figure 1 represents a device constituting that portion of my invention capable of illustration, and Fig. 2 is a modification thereof.

a a represent the two arms or levers of a pair of tongs, pivoted together at *a'*. These tongs are preferably entirely constructed of strong insulating material, such as fiber. The handles are preferably hollow, as shown in Fig. 2, and the jaws have fitted to their extreme ends blocks or electrodes *b b*, of copper or other good conducting material, the adjacent faces of which are formed with a seat adapted to grasp and hold the body upon which the device is to operate. Binding-posts *b' b'* are provided on or near the electrodes to secure the ends of the electrical conductors *c c*, extending therefrom through the hollow handles of the tongs, as shown in Fig. 2, or directly from the posts *b' b'* to a source of electricity *C*. The circuit may also include the usual resistance box and switch *R* for the purpose of varying the current. As hereinbefore mentioned, the device is particularly adapted for heating rivets. The jaws or electrodes *b b* are therefore formed on their adjacent faces with grooves.

In operation the handles of the tongs are grasped by the operator, the jaws opened, and the rivet inserted and clamped between them

in the ordinary way of operating tongs. The current is then turned on, and owing to the fact that the rivet is of high-resistance material it soon becomes heated and is ready to become inserted into the hole which is to receive it.

In the ordinary process of riveting heavy work the rivets are usually heated in a forge and carried in ordinary tongs from the forge to the place of deposit or the hole which is to receive it. It is then inserted and headed up. In passing the rivet from the forge to the place of deposit it cools considerably, and therefore requires that it be heated in the first instance too hot, or else it is too cold when it reaches the riveter.

My improved method of riveting consists in heating the rivet while it is being conveyed to its place of deposit. This is done by grasping the rivets in the tongs hereinbefore described, turning on the current, and conveying the tongs with the rivet to the hole which is to receive it and inserting the same into the hole. By this method the heating operation and the transportation of the rivet are simultaneous and the result is that the rivet is delivered to the hole at just the right heat without any loss of time.

It will be observed, of course, that the conductors connected with the tongs are flexible and may be of any desired length. It will, therefore, be convenient to carry the tongs from place to place to carry out the method.

I claim as my invention—

1. An electric heating device consisting of tongs, in combination with two electrodes, one secured to each jaw of the tongs and electric conductors secured to said electrodes.

2. An electric heating device consisting of tongs, having insulated handles and means for connecting electric conductors to its jaws.

3. An electric heating device consisting of tongs having hollow insulated handles, electrodes connected with the jaws of the tongs, and electrical conductors extending through the hollow handles and connected with said electrodes, substantially as described.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

GEO. W. BLANCHARD.

Witnesses:

FRANK L. PLUMMER,
G. H. BOOTHBY.

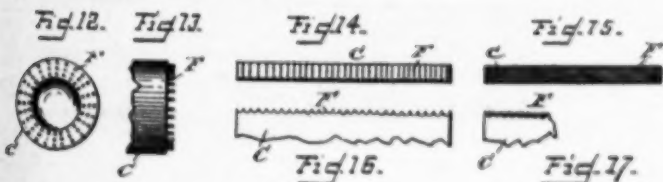
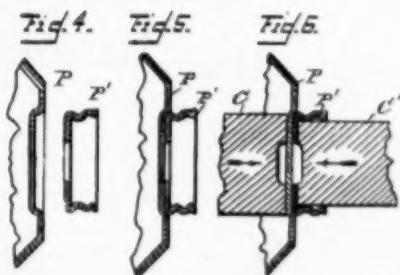
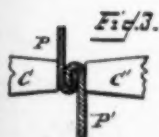
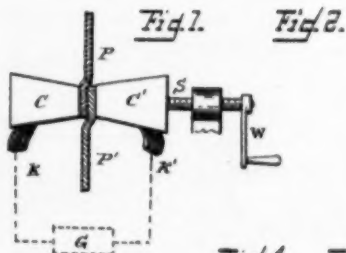
(No Model.)

3 Sheets—Sheet 1.

E. THOMSON.
ELECTRIC SOLDERING.

No. 496,019.

Patented Apr. 25, 1893.



Witnesses
J. P. Stinson
J. C. Opel

Inventor
Elihu Thomson

My Attorney
H. C. Townsend

(No Model.)

2 Sheets—Sheet

E. THOMSON.
ELECTRIC SOLDERING.

No. 496,019.

Patented Apr. 25, 1893.

Fig. 18.

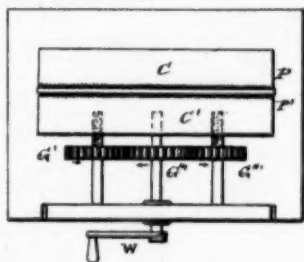


Fig. 19.

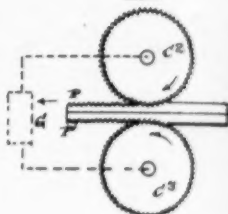


Fig. 21.

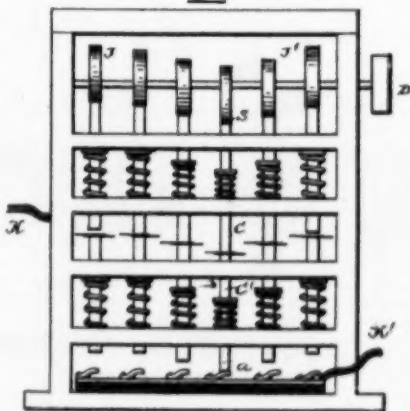
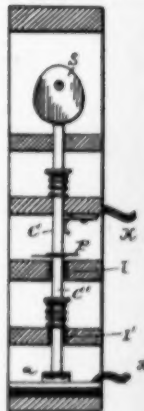


Fig. 22.



Witnesses
Jas P. Steward
Wm H. Capel

Inventor
Elisha Thomson
By his Attorney
H. B. Tomlinson

UNITED STATES PATENT OFFICE.

ELIHU THOMSON, OF LYNN, MASSACHUSETTS, ASSIGNOR TO THE THOMSON ELECTRIC WELDING COMPANY, OF MAINE.

ELECTRIC SOLDERING.

SPECIFICATION forming part of Letters Patent No. 498,019, dated April 26, 1892.

Application filed January 22, 1889. Serial No. 297,181. (No model.)

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, and a resident of Lynn, in the county of Essex and State of Massachusetts, have invented a certain new and useful Electric Soldering, of which the following is a specification.

My present invention relates to an improved method of producing soldered joints between metal pieces, and is particularly applicable to soldering sheet metal pieces flatwise. When applied to tin plate the tin itself which covers the iron plate is often sufficient for the uniting solder. In other cases solder may be applied.

My invention consists in clamping or pressing the pieces together at the seam or joint, passing an electric current through either or both of the pieces to be joined, and in sufficient volume to melt the solder or uniting metal, cutting off the heating electric current, and maintaining the pressure until the joint is sufficiently cool.

Great difficulties have hitherto been experienced in soldering long seams owing to the fact that the cooling takes place unequally and, at the moment the solder sets, parts of the seam contract and draw so as to break the joint. The pressure which holds the pieces together must be continued and the piece held rigidly during the cooling or setting of the solder. This is easily accomplished in my invention since the cutting off of the current allows the pieces to cool, while the pieces still remain clamped and held firmly during the setting of the fused metal.

My present invention, like my prior inventions in electric soldering, brazing and welding, involves the use of electric currents of low potential but large volume derived from any suitable source, together with suitable devices whereby the current may be cut off or regulated.

My invention comprises further an improvement in electric soldering consisting essentially in establishing an electric resistance to the passage of the current from the clamp or pressure block back of the joint to the metal or the work to be joined. This may be done either by modifying the surface of the pressure block itself or by modifying the

surface on which it bears, or both, or by the interposition of a thin septum, layer or zone of resisting material, or material modified in condition or form so as to oppose a resistance to the passage of an electric current. Some of these means for establishing a resistance are hereinafter more particularly described.

In the accompanying drawings:—Figure 1, shows apparatus that may be used in practicing my invention. Fig. 2, is a view of the work. Figs. 3, 4, 5 and 6, show other forms of joint and of work. Figs. 7, 8, 9, 10, 11, 12 and 13, are sectional, side and face views of clamps having particular kinds of contact faces. Figs. 14, 15, 16 and 17, are face and side views of elongated clamps for use in connection with long joints. Fig. 18, is a plan of mechanism for operating an elongated clamp. Fig. 19, is an end elevation of pressure rollers applied to the work of soldering in accordance with my invention. Fig. 20, is an edge view of a roller. Fig. 21, is an elevation of a gang of clamps and mechanism for operating the same successively and establishing electrical connection with them in accordance with my invention. Fig. 22, is a side elevation of a pair of clamps the frame in which they are mounted being shown in cross section.

In Fig. 1, P, P', are sheet metal pieces such as tin plate which are overlapped for a joint and pressed together at the overlapped portion by pressure pieces C, C', one or both of which are movable, as C', under the influence of a screw S, which, turned by a suitable crank or other device, gives pressure to hold the pieces P, P', firmly and squarely. The pieces C, C', may be suitably guided so as to move in a right line toward and from the other, the surface bearing on the overlap of the plates P, P', being made true and square so as to bear evenly thereon. Heavy electric currents are conveyed to the clamp pieces C, C', by conductors K, K', or in any suitable way from a source indicated by G. In the case of the pieces P, P', of tin plate, a union takes place at the overlap when a sufficient strength of current to melt the tin between the surfaces has been passed. The current being then cut off the pieces are allowed to cool in position under pressure until thoroughly joined after

which the pressure is taken off and the piston removed. An electric current either is applied to the piston when hot. The action is facilitated by a fan, if wanted. Slightly tilting the multi-
 15 g chambers with level oil or other medium containing oil will easily remove them from the pump P , P' , and the plate.

Fig. 2 shows the pump P , P' , chamber, and its ducted lines, the position of the current on chamber C . The chamber is connected to the source for regulating or controlling the current may be such as are described in my previous patents on Feb. 22, 1937, and on Feb. 22, 1938, or the chamber or pressure chamber may be suitably modified, as in the steps of their changing direction, when found desirable. It is not necessary to move them to pass the current across the plate from one plate to the other. The current might be passed in the pattern
 20 or direction of the line or plane of the plate.

Fig. 3 shows that the plate is made may be a double top instead of the single top as in Figs. 1 and 2. The same application of non-attractable pressure, passage of molten current and cooling under pressure with flow may be taken off, may be moved on with each a plate.

Figs. 4, 5 and 6 illustrate the action of one the plate pump of a different form. P is a round glass vessel up into form. P' is a ring pump with one edge raised to be inclined. The two are put together as in Fig. 4, the pressure blocks C , C' , applied to form the molting surface into one and from one
 25 back and current is put on until the oil in the molting surface melts and rises from as in Fig. 5. The blocks C , C' , may be of iron or other metal, or any form of Figs. 1, 2 and 3, but to concentrate the heat is the pump P , P' . It prefer to make them of steel or iron, or copper, and heat them with a heating such as heat exchanger, or form their surface which are to be applied to the work as will be described further on.

The facing of level section P , P' , Fig. 5, of the blocks C , C' , Fig. 6, for the purpose of producing or absorbing resistance to the work, or when the current action the work, which leads to the construction of heat source with low current strength. The joint between the surface pump P , P' and the blocks C , C' should be good and made to substantially no action and moving the plates together by heating for example. But in case of the difficulty of this end of the fact that the action is limited, I provide another arrangement as illustrated in Figs. 7, 8, 9, 10, 11, 12 and 13. This is simply the coming of the heated or cooled and plate, one attached, C' , with another or pressure with
 30 being only a surface of pressure—high pressure, but in a surface which will be the work. This as shown in Fig. 7 a double layer of pressure may be made creating or in might be sufficient having the action uniformly covered with equal pairs of projections. In Fig. 8, a parallel set of pressure is shown set
 35 in the surface producing a steady placed set

of ridges of current with. In Fig. 9, the ridges are raised and heated and the surface of the pressure being raised. In the two plates in Figs. 10 and 11, ridges are made only a thin wire and a thin wire of each a block as C , Fig. 12, a multitude of thin wires are set to project slightly from the surface C , as P , and are pressed from a wall of a chamber producing action in the plate. In all these cases the construction of the plate is greatly changed by the form given to the pressure as described, and the resistance to the passage of current in the work is formed which is found suitable in further production of heat or the heat under pressure from pump or regulator between the conducting plate C , C' .

Figs. 10 and 11 show the pressure of the plates as P , which are long and narrow and are used to concentrate it placed to machine in Figs. 1 and 2. Fig. 12 shows the action of the second side of pressure having a set of ridges projecting from the surface.

Fig. 13 shows the block C , of Fig. 1, a plate form.

Fig. 14 shows one of the many ways that may be used for applying different pressure of the blocks C , C' , upon the pump P , P' , which are to be raised together to cover a surface to keep pressure from outside the plate through the work. A double P pump a plate heat source which is used as C , C' , C'' to one set heat concentrated together to move the block C' , and a from stationary block C , as the work and the great resistance are added to the plate.

In Fig. 15 the pump P , P' are shown a being raised together between rollers R , R' , connected with the source of current in which outer surface are separated a groove as with the pressure chamber which is raised. The rollers are pressure which current is kept in the work and pressure is applied partly between the rollers. The P and rollers is shown in Fig. 16.

Fig. 17 shows that it is not necessary that one of pressure plate and current apply the other may be made to be applied to the same plate as to be separated upon a given time. P and P' are made of one P and P' driven by a pump P , which is connected to the same source as the rollers. The rollers are shown in Fig. 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100. 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(No Model.)

H. LEMP.

METHOD OF PRODUCING LOCALLY ANNEALED STEEL PLATES.

No. 531,197.

Patented Dec. 18, 1894.

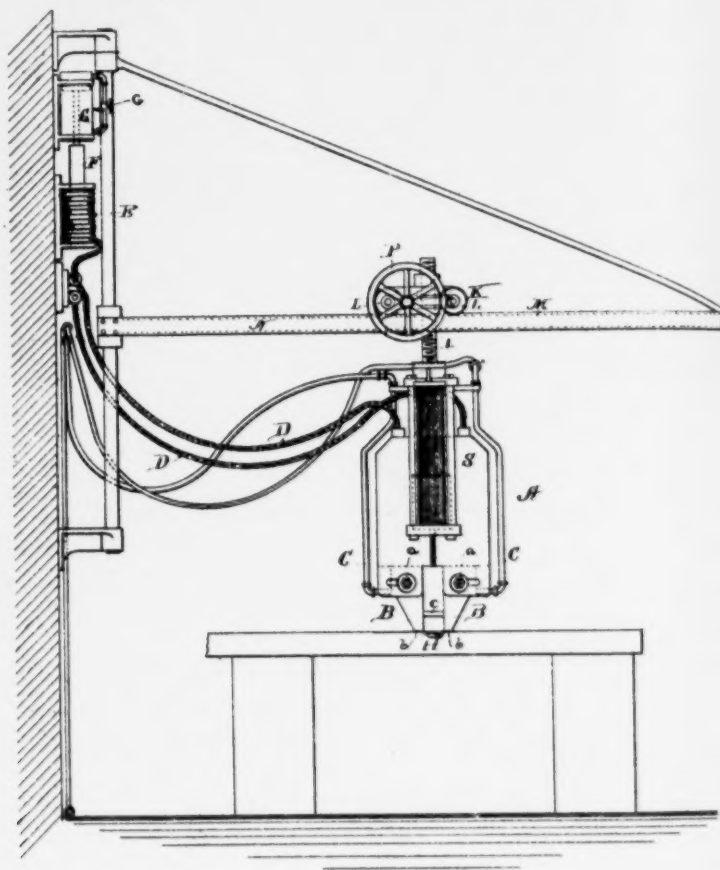


Fig. 1.

ATTEST:

T. J. Conroy
W. A. Bepko

INVENTOR
Hermann Lenz

By H. H. Tamm
Attorney.

(No Model.)

3 Sheets—Sheet 2.

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Fig. 2.

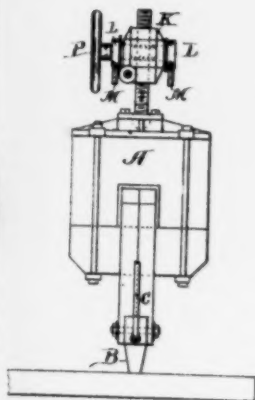


Fig. 4.

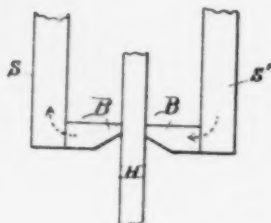


Fig. 3.



TEST:
H. Conroy
H. Chap.

INVENTOR:
 Hermann Lemp

By *H. L. Townsend*
 Attorney.

(No Model.)

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Fig. 5.

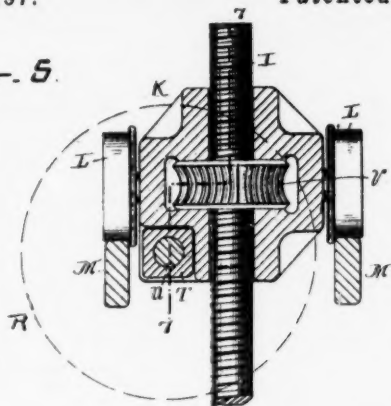


Fig. 6.

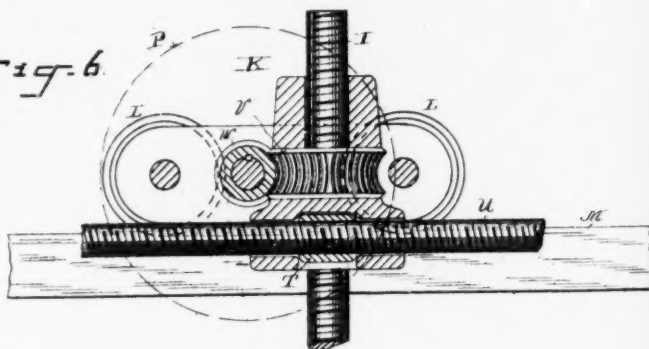
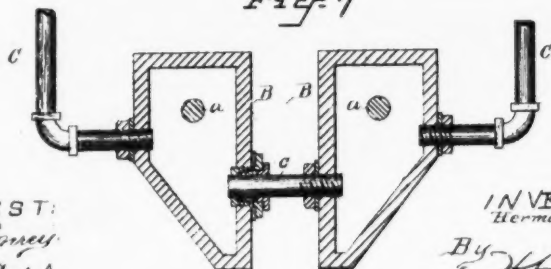


Fig. 7.



ATTEST:

J. H. Carey

J. H. Carey

INVENTOR

Hermann Lemp

By J. H. Turner

Attorney

UNITED STATES PATENT OFFICE.

HERMANN LEMP, OF LYNN, MASSACHUSETTS, ASSIGNOR TO THE THOMSON ELECTRIC WELDING COMPANY, OF MAINE.

METHOD OF PRODUCING LOCALLY-ANNEALED STEEL PLATES.

SPECIFICATION forming part of Letters Patent No. 531,197, dated December 18, 1894.

Application filed August 1, 1894. Serial No. 518,214. (No specimens.)

To all whom it may concern:

Be it known that I, HERMANN LEMP, a citizen of the United States, and a resident of Lynn, in the county of Essex and State of Massachusetts, have invented a certain new and useful Method of Producing Locally-Annealed Steel Plates, of which the following is a specification.

My invention relates to a novel method of obtaining hardened plates or other pieces of metal, such as steel, locally softened to admit of cutting, tapping or drilling, and is especially useful in the production of Harveyized armor plates which require to be provided with bolt holes, countersinks, embrasures or other holes or openings when in place upon the ship, though it is also applicable to other plates or pieces of metal and whether hardened all through, or merely at and near the surface.

My invention consists essentially in hardening the whole piece of steel or other metal, then locally heating the spot or portion in the body thereof to be softened, to the proper temperature, by an electric current passed through the metal itself, and then allowing the said portion to cool while keeping it supplied with a gradually diminishing amount of heat from such current, the rate of diminution being adjusted, as hereinafter described, to the capacity of the surrounding mass of metal to carry the heat away; so as to cause it to cool gradually and at a sufficiently slow or proper rate to become soft at such heated portion. By producing the local heating through generation of heat in the desired portion of metal itself by the passage of an electric current through such portion, the heating may be much more closely confined or localized and the rate of cooling better controlled.

My invention consists further in certain appliances designed to aid in the purpose of locally heating by the electric current and of confining the heating to the desired spot.

It is well known that an ordinary piece of steel such as tool steel, manganese steel, &c., which, through its peculiar chemical composition has been tempered or hardened by plunging it in water after heating or by other-

wise cooling it off rapidly, may be softened again by bringing it to the right temperature and leaving it in the open air to cool off gradually. It may of course be made softer yet by decreasing the rate of cooling by surrounding the metal with some refractory or heat insulating substance such as ashes, magnesia, &c.; but for all practical purposes an ordinary piece of steel may be annealed or softened by allowing it to cool in the air. If, however, the attempt be made to soften or draw the temper at an individual spot in a large plate or piece of hardened metal by heating it to the right temperature and then removing the heating influence suddenly, the surrounding metal will carry the heat away so fast as to chill the heated portion and harden the same as if the heated spot alone had been plunged into water or other cooling medium. Moreover, no covering with any heat insulating material would prevent this inasmuch as a large percentage of the hot metal is in direct contact with cold metal from which it cannot be isolated by any known means. For this reason in the production of Harveyized plates for armor plates, for instance, it has not been found practical to first subject the whole plate to the hardening process and then locally heat the part which is to be cut, tapped or drilled; nor has it been found practical to first cut, tap or drill the metal plate and subsequently harden it, for in the hardening operation the plate is liable to become deformed or to crack around the openings or holes. It has, therefore, been found necessary either to tap, cut or drill the hardened metal at great difficulty and expense or else to locally apply some material to parts of the plate which will prevent it from becoming hardened during the hardening process.

My invention obviates the difficulties and objections heretofore met with in dealing with hardened armor plate having a skin or coating of hardened metal as well as in dealing with other large masses or pieces of hardened metal which require to be cut or formed at some part, and consists essentially in first producing a complete plate or piece of the hardened material including the portion to be cut

or formed, then by the passage of an electric current through the metal, heating the portion to be formed or cut to the proper temperature for drawing the temper and then allowing it to cool at such portion while supplying it with a gradually diminishing amount of heat from such current to prevent the fall of temperature in the heated portion due to the presence of the large masses of metal in direct contact with it from being a too rapid one.

By my invention the hard steel plate may be softened in isolated spots so that it may be readily drilled and tapped at such isolated spots alone, or continuous lines or extended surfaces may be softened for the purpose of allowing the material to be cut along the softened line.

In carrying out my process by the use of electric currents a transformer having a secondary adapted to supply current of large volume, such as is employed in electric metal working operations, may be used and the terminals thereof brought into contact with the previously hardened plate or mass of metal on either side of the spot to be annealed or softened. The current is made to enter the plate at one contact and leave it at the other bringing the intermediate portion to a dull red heat. If the process were stopped at this point and the current withdrawn, the metal would chill and be as hard in the spot as anywhere else but, if instead of withdrawing the current suddenly it be gradually diminished in amount in any well known manner as for instance by proper regulating devices, the temperature of the heated portion may be made to fall as gradually as it would if that portion were separate from the whole piece and left to cool on its own account. The depth to which this local softening process can be carried depends largely upon the arrangement of the contacts or manner of introducing the electric current by which the heat is generated in the body of the metal by the passage of the current through it. If the plate or piece of metal be hard through its whole thickness and not merely on its skin surface, the current may be made to enter at one side and leave at the other passing entirely through the mass of metal. On the other hand if only the skin is to be treated the contacts may be placed side by side upon the same surface.

The diminution in the rate of flow of the current after the metal has been brought to the proper heat may be produced by any desired form of current regulator as, for instance, by means of a reactive coil in series with the heating apparatus or by a resistance in series with the field of the generator furnishing the alternating currents for the heating transformer. Preferably, an automatically operating regulator actuated by gravity or other power is employed. The action of such regulator is adjusted to the desired rate by clockwork or any other time adjusting

means which shall produce the required rate of decrease of such heating current in the metal.

The amount of heat furnished by the current might be gradually diminished or removed by moving the electrodes along the surface of the metal at the parts where it is to be locally heated and this may be a desirable way of producing a softened line of material in the hardened mass the rate of movement being, of course, adjusted to the particular circumstances of each case and being made slower where the mass of surrounding cold metal is larger or heavier. I have found, however, that good results may be obtained by adjusting the action of a current regulating resistance applied to any proper portion of the electric apparatus which furnishes the heating current in such manner as by its action to cause a diminution in the flow of said current.

In order to prevent the current from spreading too much and heating the metal beyond the desired zone of softening care should be taken not to use too heavy or powerful an electric current. This is particularly the case where the attempt is made to pass the current through the metal from one side of the plate to the opposite side.

I have obtained good results in the case of Harzeized plates by means of two copper contacts resting side by side upon the plate about one inch apart and each copper contact being about one inch square, then passing the current through the metal until the temperature between the contacts show a just visible red, and then reducing the heating current very gradually through a period of about ten minutes in which period the metal is allowed to cool gradually past the critical stage or temperature at which the material proceeds to set or become hard if the change of temperature is at such point rapid or sudden.

In the accompanying drawings I have shown some of the electrical apparatus that may be employed in practicing my invention.

Figure 1, is a general side elevation of an apparatus in which a transformer is used for heating one side of a piece of metal at an isolated spot. Fig. 2, is an edge elevation of the transformer. Fig. 3, shows in end elevation the transformer electrodes or contacts. Fig. 4, illustrates the manner of applying the electric contacts when the current is to be passed through from one side to the opposite side of the plate. Fig. 5, shows on a larger scale a vertical transverse section through the carriage K, taken in the plane of the axis of roll. Fig. 6, is a vertical section taken longitudinally of the carriage in the planes indicated by the line 7, 7, of Fig. 5; and Fig. 7, is a vertical section through the electrodes B, B, taken in the plane of the axes of pipes C, C, and C. Referring to Fig. 1, A, indicates the transformer which may be of any usual type suitable for generating heavy currents.

S, is the secondary and B, B, the contacts reduced toward their lower ends to produce the small contact surfaces *b, b*, and made, preferably, adjustable on the terminals of the secondary for the purpose of varying the extent, of heated metal between them. These contacts or electrodes are preferably hollow and a stream of cooling liquid is circulated through them by means of pipes C, C.

At *c*, is a pipe connecting the two hollow electrodes.

One way of mounting and constructing the electrodes B, B, is illustrated in Figs. 1, 2 and 7. Each electrode is seated in a slide formed by projections on the lower end of the secondary S, and has a bolt *a*, passing through it and through slots in said projections, as shown. On the ends of these bolts are washers and nuts for clamping the electrodes at the desired distance apart. The pipe *c*, is preferably of insulating material and may be firmly attached at one end in the wall of one electrode while it slides through a gland in the wall of the other electrode, or it may be of metal and be insulated from the electrodes by suitable bushings of insulation. The water pipes C, may be rigidly secured in the electrodes and move bodily therewith or they may pass through glands in the walls of the electrodes as desired. I have shown them as rigidly attached to the electrodes and, on account of their considerable length, depend upon their resilience in the adjustment of the electrodes. By thus keeping the contacts artificially cool the heating in the mass of metal is better localized at the portions thereof between the electrodes themselves. In practice it will be found that when only slight contact pressure is used there is a tendency of the metal at the surface in contact with said electrodes to heat more than at the portion between them but by artificially cooling the electrodes the heating may be better confined as stated.

The flexible conductors which supply the primary of the transformer are indicated at B, D. In their circuit is shown a reactive coil E, of any suitable construction whose core F, is suspended from an adjustable dash-pot G, of any suitable character employed for the purpose of checking the descent of the core by gravity into the reactive coils. By this device a retarded rate of action of the regulator is obtained to produce the diminished rate of flow of the current. To suit different cases, an adjustment may be provided to regulate the rate of descent or movement of the movable portion of the regulator consisting, in this case, of the movable core F. When a dash-pot is employed the adjustment may be obtained by providing the dash-pot with a by-pass having a cock G', which will regulate the rapidity of the flow of air or liquid in the dash-pot from one side of its piston to the other. By adjusting this cock the flow of current may be caused to diminish at the

desired rate varying as will be understood under different circumstances.

II, indicates a Harveyized plate under treatment for local softening and the portion involved in the heating current is indicated by the shaded portion between the electrodes. To aid in moving the transformer over the surface of the metal plate II, it may be hung from a rod I, by a ball and socket joint or other flexible suspension. The rod I, is in turn mounted on a carriage K, which has wheels L, running on the rails M, of a swinging crane or bracket N. Wheels P and R, operate on suitable mechanism mounted on the carriage and connected with the rod I, and the wheels L, to lower the transformer or to move it along the rails. Various forms of mechanism may be devised for manipulating the transformer and its carriage. For the purpose of illustration I have shown the carriage provided with a recess for the reception of a steel nut T, through which and suitable ways in the carriage passes the screw U, which is rotated by wheel R, in moving the carriage and the suspended transformer over the plate. As a means for raising and lowering the transformer, I have shown a worm nutas V, located in the frame of the carriage and turned about the suspending rod I, by means of the worm W, which is rotated by the hand wheel P. By these means and by the swinging crane the transformer may be adjusted over any desired spot on the plate or mass of metal II.

As will be seen in Figs. 3 and 4, the electrodes or contacts where they engage with the mass of metal are made rather small, this being for the purpose of localizing the heating current so far as possible and the undue heating at such points is prevented by the artificial cooling.

What I claim as my invention is—

1. The herein described method of obtaining a hardened piece of metal with a portion only in the body thereof softened, consisting in hardening the whole piece, generating heat in the portion to be softened by an electric current passing through the metal itself at the portion whose temper is to be drawn, and then gradually diminishing the amount of heat supplied by the current to said heated portion at such a rate that, at any period of time, the amount of heat supplied is nearly but not quite equal to the amount of heat being absorbed by the surrounding metal, as and for the purpose set forth.

2. The herein described process of locally softening or drawing the temper from a Harveyized plate or similar plate having a skin of hardened metal, consisting in passing a heating electric current through the metal from one point on the surface thereof to another point by electric contacts engaged with said surface, heating the metal by the heat generated through the passage of the current in the metal, and to a dull red heat, and then

gradually removing or withdrawing the electric current, at such rate that the amount of heat supplied is nearly but not quite equal to the amount of heat being absorbed by the surrounding metal, as and for the purpose described.

3. In a heating device employing a transformer, the combination with the secondary, of hollow contacts or electrodes connected thereto, feeding and discharge pipes connected respectively to said electrodes, and a pipe of insulating material connecting said electrodes for the purpose set forth.

4. In a heating device employing a transformer, the combination with the secondary, of hollow electrodes seated in ways in the ends of the secondary and adjustably secured in place, feeding and discharge pipes connected respectively to said electrodes, and a connecting pipe between the electrodes properly insulated therefrom and having a sliding union with one of them.

5. In an apparatus for producing local annealing, the combination with the heating device, of a swinging bracket provided with a track, a carriage running on said track for carrying said heating device, a screw located in said bracket, a nut in the carriage fitted to

said screw, a hand wheel for turning the screw to propel the carriage, and means for raising and lowering said device for the purpose set forth.

6. In an apparatus for producing local annealing, the combination with the heating device, of an overhead track, a carriage on said track, a screw-threaded rod connected to the heating device, a worm-nut located on said carriage to receive said rod, a worm for operating said nut to thereby raise and lower the heating device, and means for moving the carriage along its track for the purpose set forth.

7. The combination, substantially as described, with an electric heating apparatus, of an automatic current regulator for producing a diminished rate of flow of the heating current, and a retarding device connected with said current regulator whereby a slow diminution in the supply of heat may be produced.

Signed at Lynn, in the county of Essex and State of Massachusetts, this 30th day of July, A. D. 1894.

HERMANN LEMP. [L. S.]

Witnesses:

W. A. M. TAGGART.

H. N. SWEET.

(No Model.)

2 Sheets—Sheet 1.

H. LEMP.

APPARATUS FOR ELECTRIC WELDING.

No. 553,923.

Patented Feb. 4, 1896.

Fig. 1.

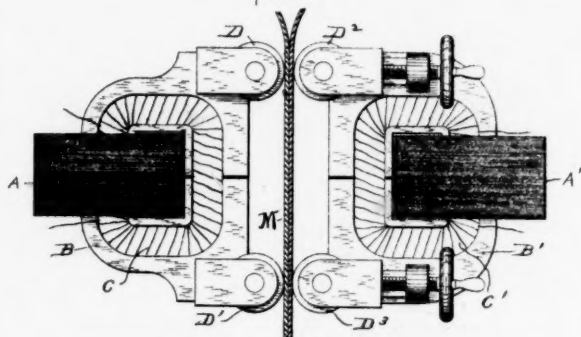


Fig. 2.

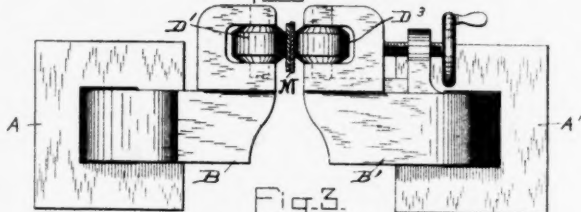
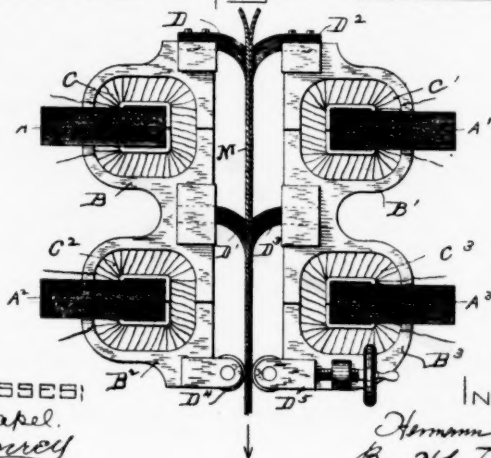


Fig. 3.



WITNESSES:
Louis Capel.
G. Conroy

INVENTOR:

Hermann Lemp
By H. B. Townsend
Att'y.

(No Model.)

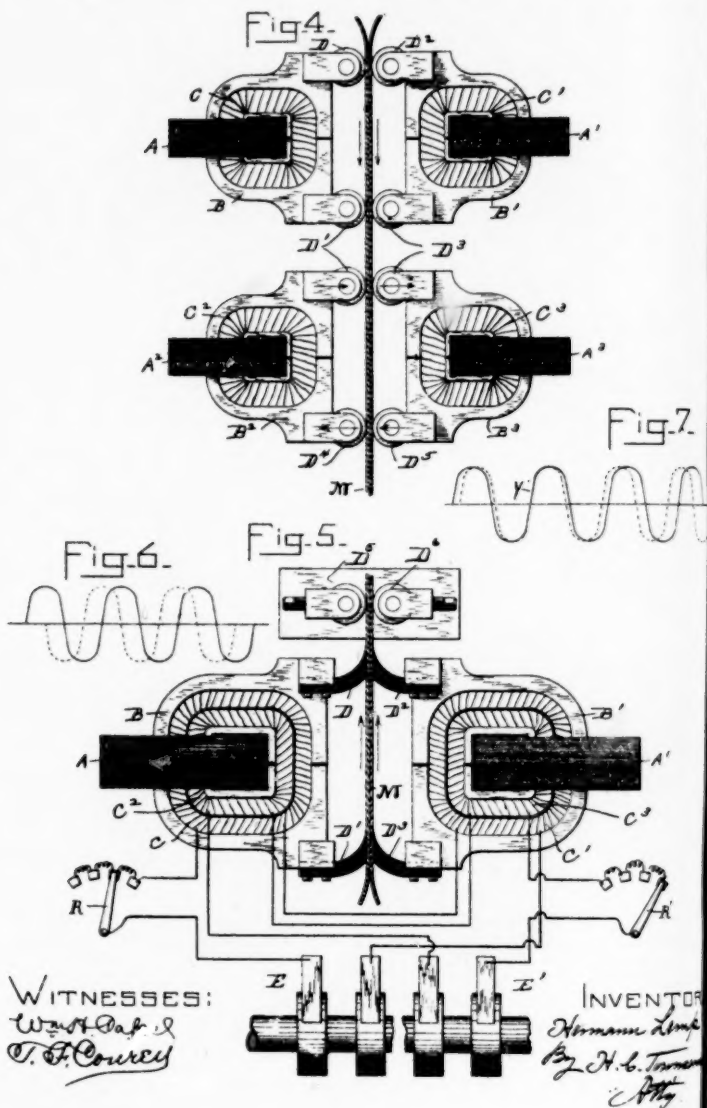
2 Sheets—Sheet 2.

H. LEMP.

APPARATUS FOR ELECTRIC WELDING.

No. 553,923.

Patented Feb. 4, 1896.



UNITED STATES PATENT OFFICE.

HERMANN LEMP, OF LYNN, MASSACHUSETTS, ASSIGNOR TO THE THOMSON ELECTRIC WELDING COMPANY, OF MAINE.

APPARATUS FOR ELECTRIC WELDING.

SPECIFICATION forming part of Letters Patent No. 553,923, dated February 4, 1896.

Application filed June 17, 1891. Serial No. 396,547. (No model.)

To all whom it may concern:

Be it known that I, HERMANN LEMP, a citizen of the United States, and a resident of Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Apparatus for Electric Welding, of which the following is a specification.

My invention relates to those electric metal-working operations in which one or more pieces of metal are heated by means of the electric current.

The object of my invention is to provide for a more thorough and uniform heating of the work in the operation; and the invention consists in applying to the metal heating electric currents of different frequency during the manipulation thereof, and the invention consists in the combination, arrangement and operation of parts as hereinafter fully described and set forth in the claim.

My invention is especially applicable to a metal-working operation consisting in the forming of long joints between strips, plates, bars or rods—such as boiler-plates or other articles which are at present riveted—by a welding, soldering, cementing or similar operation, though it is likewise applicable to the simple shaping, rolling or forming of a metal rod, bar or strip fed between the forming pressure devices.

I shall hereinafter describe my invention more particularly as applied to the formation of joints between long strips, bars or plates.

In carrying out my invention the heating-currents applied to the work may be two independent currents passed through the strips to be joined one in a direction parallel to the joint and one transversely or at right angles to the joint, or nearly so. Such transverse current might be one made to pass through or across the pieces diagonally, as the result of two independent alternating currents interfering or displaced in phase.

I include in my invention by the term "transversely" a current passed diagonally as well as at right angles through the metal piece. The two heating-currents may be passed through the same portion of the one or more strips, plates or rods at the same time or they may be entirely distinct and sent through one

after the other. The heating-currents might be passed through a portion of the work longitudinally, which is some distance removed from the pressure devices and the current passed through such portion transversely only after it has reached the pressure devices.

In carrying out my invention I prefer to employ two distinct sources of energy supplying current to the work.

In the accompanying drawings, Figure 1 illustrates in plan an apparatus that might be used for the purpose of uniting plates, strips, or bars of metal and heating the same in the manner employed previous to my invention. Fig. 2 is an end view of the same. Fig. 3 illustrates an apparatus that may be employed in practicing my present invention. Figs. 4 and 5 illustrate other apparatus, also suitable for the purpose of my invention. Figs. 6 and 7 are graphic representations of currents as used in the method hereinafter explained.

Referring to Fig. 1, B and B' indicate the secondaries of two transformers, each secondary being made in the manner commonly employed in electric metal-working apparatus, as a solid bar or mass of copper having a primary C or C' applied in a groove in its side. A A' are the laminated iron cores for said transformers.

D D' D² are electrodes or contacts which are designed to pass heating-currents from the transformers into the work, here indicated at M as consisting of two strips of metal fed in the direction of the arrow between the electrodes or contacts. The electrodes or contacts D' D² are in the form of rollers and constitute pressure devices that will serve to unite the metal or otherwise operate upon it as its heated portions pass between them. The two electrodes D D² may be similarly constructed as rollers and one of them provided with a screw for pressing it firmly against the work.

In using this apparatus, according to the old method, the heating-current was caused to pass through the section of metal included between the electrodes in the direction of the arrow from the point where the contacts D D² bear to the point where the pressure devices D' D² bear, or to some point between

the pressure devices and the first-named contacts or rollers—that is to say, the current was passed in a longitudinal direction through the work before it reached the point where the pressure devices were applied. When the current is applied in this way, the work being drawn in the direction indicated by the arrows, the rollers $D D^3$ being forced toward each other slightly would effect the welding or otherwise act upon the heated metal. In this operation the work has been found to heat principally between the extremities of the secondaries or at the intermediate portion lying between the two sets of electrodes or contacts; but the parts of the work near the rollers would keep comparatively cool, because of the fact that the rollers being of large mass and good conducting material would have a considerable cooling effect. Hence it frequently happened that by the time the heated work reached the point of application of the pressure devices it would be cooled down so that the rollers could not act with the best effect.

It has also been proposed in some cases to pass the current transversely through the work—that is to say, from contact D to D^3 , or reversely, and also from roller D' to D^3 , or reversely. This would be effected by properly combining the transformers as to polarity so that they should work in series with one another. In this method the work would heat at or near the contacts or electrodes; but the action was not satisfactory, because the part which would be heated between D and D^3 would cool while passing to the pressure devices and would have to be reheated at the latter point in order that it might be welded or formed. Such a process would obviously be a wasteful one.

My invention avoids the difficulties incident to the methods just explained and produces a uniform, effective and economical heating of the work.

In Fig. 3 I have illustrated apparatus which may be used for the purpose of carrying out my invention. I have shown the secondaries of transformers as the source of the heating current, but do not limit myself to the employment of such instrumentalities.

In Fig. 3 I have shown practically two sets of transformers, one consisting of secondaries $B B^3$, primaries $C C^3$, and cores $A A^3$, the other consisting of secondaries $B^2 B^3$, primaries $C^2 C^3$, and cores $A^2 A^3$. The two secondaries $B B^3$ on one side and $B^2 B^3$ on the other are united in a single casting, but practically form each a separate secondary circuit. The contact-terminals of said secondaries are indicated at $D D^3 D^2 D^3$. The terminal D' serves as a common terminal for the two transformer secondaries $B B^3$, and the terminal D^3 serves as a common terminal for the transformer secondaries $B^2 B^3$. Those terminals which are not employed for applying the pressure may be, as indicated, simple brushes, while those—to wit, $D^4 D^5$ —which are used

for applying the welding or forming pressure are rollers. By connecting the primaries A and A' to the source of energy in a manner cause both poles or contacts $D D^3$ in the respective secondaries to be of one sign and both poles or contacts $D' D^3$ thereof to be of the opposite sign a current will flow in the work between the point of application of contacts $D D^3$ and the point of application of contacts $D' D^3$, the secondaries then supplying the current in multiple, and that portion of the work extending from $D D^3$ to $D' D^3$ serving to complete the circuit in the respective secondaries. By connecting the primaries $C^2 C^3$ to the source of energy in a manner cause the poles or contacts $B' B^3$ of the respective secondaries to be of unlike sign and the poles or contacts $D^4 D^5$ thereof to be of the reverse unlike signs respectively the current will pass transversely through the strips, bars or rods constituting the work at the points of application of the contacts D' , D^4 , D^5 and D^3 —that is to say, current will flow through the secondaries in series including the portions of work between D' and D^3 and between D^4 and D^5 . As the work is supposed to be continually moving along, any particular section will be first heated by the current passing longitudinally and then by the current passing transversely through it.

Fig. 4 illustrates practically the same arrangement, with the exception that the two sets of transformers are entirely separate as to their secondaries, and an extra pair of contacts is therefore required. The arrows indicate the directions of the current in the two systems.

Fig. 6 graphically shows the necessary conditions of the current that two secondaries may be in series and heat the work transversely, as in the second heating described in connection with Figs. 3 and 4. The full-lined curve may represent the waves of the alternating current in the secondary B^2 , Fig. 4, and the dotted curve the waves of current in secondary B^3 . It will be seen that when the current in B^2 is at a maximum and of positive sign, say, that in B^3 is at zero, but approaching its maximum negative sign, so that the two currents are in series, and the flow of currents as before mentioned. In order that the two currents may be in multiple, as in the longitudinal heating, the phases of current in each secondary must rise and fall simultaneously, or, in other words, coincide.

Fig. 5 illustrates apparatus wherein one secondary is made to provide the two heating effects. Each secondary is provided with two primary coils. B has the coils C and C^3 , and B' the coils C^2 and C^3 . C and C^2 are connected in such manner that the secondary currents will be in multiple, and $C^3 C^3$ in such manner that the secondary currents will be in series. Each "set" of primaries is supplied from different sources of electric energy, one source being an alternating current having a greater frequency than the other. For instance, CC^3

is supplied with current from machine E and C' C' from machine E'. Suppose the current from E' has a frequency that is greater than that of E, then the currents may be graphically shown as in Fig. 7. The dotted curve is the current E' and the full curve that of E. It will be noticed that at certain points, as at Y, the two curves coincide, and the secondaries B B' will supply current to the work in multiple. At some other instant the curves will be just opposed to each other and the currents of B B' will be in series. At intermediate points a combination of effects will be produced, which may be readily studied out from Fig. 7.

The arrows in Fig. 5 denote the direction of movement of the work.

It will be obvious that, as in the case of Figs. 3 and 4, the pressure-rolls, Fig. 5, might be made the terminals of the heating source, so that the current passed transversely through the work would pass at the point of application of the pressure. It is also apparent that as the primaries furnishing longitudinal current are independent of those furnishing the transverse current, regulating devices may be used in each circuit to cause one or the other heating effect to predominate. In Fig. 4, R and R' are such regulating devices, so that if it is desired to weld stock of large section a heavier longitudinal current may be used without increasing the transverse current. Thus, for instance, the longitudinal current would be increased when the thickness of the piece to be welded was increased, but where the width was not. This would make a

heavier path for the longitudinal current, but the section of stock through which the transverse current flowed would be no greater. The length of the path through the work for the transverse current might be slightly increased but would be almost nothing as compared with the increased section for the longitudinal current; or, if the increase of thickness were attended by an increase of width then the transverse current would be increased in the proper ratio. Again if the width of the stock was increased and the thickness correspondingly decreased in such ratio as to maintain the same area of cross-section transversely through the bar or bars to be heated the longitudinal current would remain the same while the transverse current would need to be larger, as the cross-sectional area of the path would now be larger.

What I claim as my invention is—

In an electric metal-working apparatus, the combination substantially as described with two transformers supplying heating-currents to the same work, of alternating-current sources connected respectively to the primaries of said transformers, and adapted to supply alternating currents of different frequency.

Signed at Lynn, in the county of Essex and State of Massachusetts, this 12th day of June, A. D. 1891.

HERMANN LEMP.

Witnesses:

C. A. WILKINSON,
W. B. LEWIS.

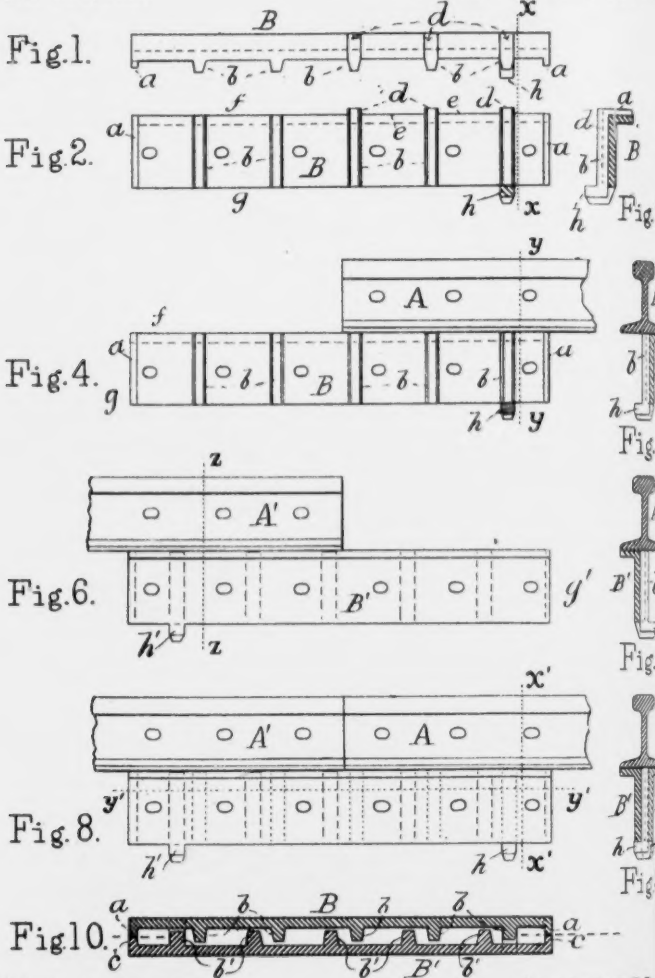
(No Model.)

2 Sheets—Sheet 1.

W. ROBINSON.
RAIL JOINT.

No. 574,942.

Patented Jan. 12, 1897.



WITNESSES:

INVENTOR

James H. Ripley
J. R. Hayward.

Wm. Robinson.

(No Model.)

2 Sheets—Sheet 2.

W. ROBINSON.
RAIL JOINT.

No. 574,942.

Patented Jan. 12, 1897.

Fig. 11.

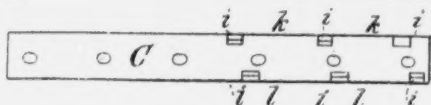


Fig. 12.

Fig. 13.

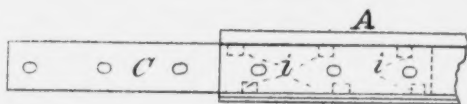


Fig. 14.

Fig. 15.

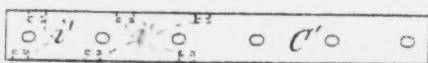


Fig. 16.

Fig. 17.

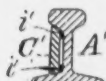
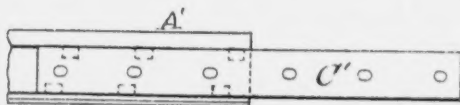


Fig. 18.

Fig. 19.

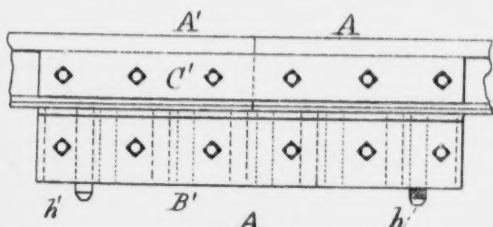
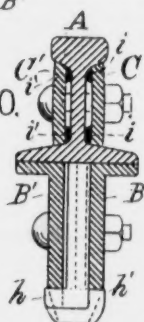


Fig. 20.



INVENTOR,

W. Robinson.

WITNESSES:

James H. Ripley.

J. R. Hayward.

UNITED STATES PATENT OFFICE.

WILLIAM ROBINSON, OF BOSTON, MASSACHUSETTS.

RAIL-JOINT.

SPECIFICATION forming part of Letters Patent No. 574,942, dated January 12, 1897.

Application filed November 14, 1894. Serial No. 528,715. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM ROBINSON, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Rail-Joints, of which the following is a specification.

This invention relates to improvements in the rail-joint shown and described in my application for a patent thereon filed October 7, 1893, Serial No. 487,530, and I do not therefore herein claim anything described and broadly claimed in the aforesaid application.

The nature of my invention will be understood from the description which follows, reference being had to the accompanying drawings, which form a part of this specification, in which—

Figure 1 is a top view of a girder-plate, illustrating a part of my invention. Fig. 2 is a side view of the same; and Fig. 3, a cross-section through the lines xx , Figs. 1 and 2. Fig. 4 shows the end of a rail with the girder-plate secured thereto; and Fig. 5 is a cross-section through the line yy , Fig. 4. Fig. 6 is a duplication of Fig. 4 on the opposite end of the rail, or preferably for my purpose, as shown, on the end of the rail adjacent and corresponding to that shown in Fig. 4. Fig. 7 is a cross-section through the line zz , Fig. 6. Fig. 8 shows Figs. 4 and 6 combined and the invention thus more fully developed. Fig. 9 is a cross-section through the line xx' , Fig. 8. Fig. 10 is a horizontal section through yy' , Fig. 8. Fig. 11 shows the side splice-bar, and Fig. 12 a cross-section of the same. Fig. 13 shows the side splice-bar secured to the end of a rail, and Fig. 14 is a cross-section of the same. Fig. 15 shows a similar side splice-bar for the adjacent rail, and Fig. 16 a cross-section of the same. Fig. 17 shows said splice-bar and rail secured together, and Fig. 18 a cross-section of the same. Fig. 19 shows the rail-joint complete in elevation, and Fig. 20 is a cross-section of the same.

A is a railroad-rail, to the bottom of which the girder-plate B is rigidly secured, preferably by the electric welding process. The girder B, as shown in the drawings, has one half of its length projecting under and welded to the bottom of the rail A, the other half projecting beyond the end of said rail and under

the adjacent rail for the purpose of supporting the latter.

The form of the girder-plate B is peculiar. By referring to Fig. 10 and some other figures it will be seen that the vertical web of the plate B is provided with inwardly-projecting vertical ribs or lugs b , while the corresponding plate B' is similarly provided with inwardly-projecting ribs or lugs b' . The dotted line passing longitudinally midway between the plates B B' coincides with the center line of the rail, as shown also in dotted lines in Figs. 5, 7, and 20.

The reason for making the girder-plate B in the form described is this: When two pieces of metal are electrically welded together, the molten metal flows so as to make a rough and enlarged joint, and when one piece of metal is thus welded to another in such a way as to form an angle between the two the angle is partly filled up and rounded out by the molten metal. If, therefore, the plates B B' were formed with a continuous smooth edge on their inner surface and were welded with this edge coinciding with the longitudinal center line of the rails, the molten metal would partly fill up the angle formed between the plates and the rails at the longitudinal center line of the latter. As a consequence the aforesaid plates B B' could not come close together because of the intervening overflowed metal, that is, the adjacent rails would be out of alignment. In the present instance, however, the girder-plates B and B' are located to one side of the center line of the rails, leaving a considerable open space between the main body or vertical webs of said plates. At the same time the projecting ribs $b b'$ extend under and even beyond the center line of said rails, whereby the adjacent rails are centrally supported by each of the plates B B'.

It will be observed that the ribs $b b'$ alternate with each other, but do not come close together; also, that there is space left between said ribs, respectively, and the webs of their opposite girder-plates. Thus the overflow of molten metal taking place in welding the plate B to the rail A will not interfere with the proper location and alignment of the plate B' when the adjacent rails are brought together, nor, on the other hand, will the over-

flow metal caused by welding the plate B' to the rail A' interfere with the proper position and alignment of the plate B under similar circumstances, since there is sufficient space left between said plates B B' to allow for the overflow metal without the latter interfering with the proper position of adjacent parts. The plates B B' are provided, respectively, also with the ribs or projections a and c. When the adjacent rails are brought together, the ribs a abut against the ribs c, thus fixing the proper alignment of the rails. These ribs a and c are not affected by the welding, since they are removed sufficiently far from the location of the welding not to be affected by it.

The upper surface of the plate B is provided with slight upward projections or contact-points d. These points are brought in contact with the bottom of the rail in proper position preparatory to welding. When the welding-current is turned on, it is localized at the points d, and only these points and the corresponding points of the rail are brought to a welding heat. As a consequence the weld is much more quickly made and with much less current than if the continuous upper surface of the plate B were brought in contact with the rail. This arrangement therefore is in the interest of economy and practicability. Perhaps a much more important consideration, however, is this: When the contact-points d and the corresponding points of the bottom of the rail have reached a welding heat and the plate B and rail A are rigidly clamped together to produce the weld, the intervening parts e of the upper surface of the plate B and the parts of the rail corresponding thereto have not been raised to a welding heat. Consequently when these parts come together the welding compression can force them no farther and therefore the parts e and the normal bottom of the rail are retained in perfect alignment with the upper surface f of the outer end g of the plate B. Thus provision is made for keeping the lower and upper surfaces of the adjacent rails in perfect alignment.

It is to be observed that the contact projections d are placed only on the inner or welding-end of the plate B, the outer end g of said plate being free from such projections.

The plate B is provided at or near its inner end and at the bottom with the inwardly-projecting lug or support h, and the plate B' is similarly provided with the supporting-lug h' at its inner end.

Now when the rails A and A', with their respective plates B and B', are brought together in forming a joint, as shown in Figs. 1 and 9, the lug h' of the plate B' supports the free or outer end of the plate B, and in like manner the lug h of the plate B supports the free or outer end of the plate B'. Thus each rail is supported close to the junction of the two rails by the girder-plate welded to the bottom of the adjacent rail, and each rail, in

addition, is supported, through the girder-plate welded thereto, by the lug at the extreme inner end of the girder-plate welded to the adjacent rail, that is, each rail is supported far beyond its outer end by the lug on the inner end of the girder-plate welded to the adjacent rail. This forms an interlocked or trussed joint which in itself gives an enormous support to the ends of both rails.

The bolt-holes in the plates B B', or some of them, are oblong in shape to allow for the proper expansion and contraction of the rails, and in forming the joint these plates are preferably securely bolted together, as shown in Figs. 19 and 20.

To further enhance the efficiency of the joint, the fish-plate C is welded to the side of the rail A, one end of said fish-plate being welded in the side groove of said rail and the other end projecting beyond the end of the rail, as shown in Figs. 13 and 14.

The fish-plate C is provided on its inner side with the projections i near the upper and lower edges of said plate.

When the plate C is placed in the groove of the rail in position to be welded, these projections i find a bearing against the rail adjacent to the upper and lower corners of the groove of the same. The projections i are normally long enough to keep the main body of the plate C a short distance away from the rail. As soon, however, as the welding-current is turned on it quickly brings the projections i and the parts of the rail touched by them to a welding heat. The clamp is now applied to press the plate C and rail together to complete the weld, as shown in Figs. 13 and 14.

It will be seen that the upper and lower edges k l of the plate C intervening between the projections i are not brought to a welding heat, and consequently the pressure exerted in welding brings these edges up to a close-fitting position against the flange and head of the rail, as shown in Fig. 14, but does not interfere with the proper alignment of the edges of the plate C throughout any part of their entire length. As a consequence when the plate C is welded to one rail its outer or free end will fit exactly into the groove of the adjacent rail and the two rails will be in exact alignment.

It will be noted that if the whole surface of the upper and lower edges of the plate C in contact with the rail were brought to a welding heat the welding pressure on the plate C would be liable to press the welded end out of alignment with the free end, and consequently the adjacent rails when brought together would be out of alignment.

The construction shown in Figs. 15, 16, 17, and 18 is identical with that described in connection with Figs. 11, 12, 13, and 14, but applied to the adjacent rail. It is not necessary, therefore, to specifically describe these figures.

The completed joint is shown in Figs. 19

and 39, in which the rail A, provided with the welded plates B and C, and the rail A', provided with the welded plates B' and C', are brought together. The outer or free ends of the plates B and C overlap the rail A' and the free ends of the plates B' C' overlap the rail A.

Bolts passing through the plates B B' and through the plates C C' and the rail hold the parts firmly together, forming a perfectly-trussed joint, the rails in perfect alinement in all directions and with proper provision for the expansion and contraction of the rails.

The rails are supported on ties or in any usual or suitable manner not necessary to illustrate.

If desired, the upper and lower projections on the plate C might be joined together, forming a welding-rib across said plate, as shown in dotted line in Fig. 16, but I prefer the arrangement of small independent projections to facilitate rapidity of welding, economy of current, and in order to have several small welding-spots distributed over the rail rather than to have any single larger surface of the rail brought to a welding heat, since the latter would be liable to deteriorate the rail. For the same reason I prefer to put the upper and lower projections diagonally opposite each other, as shown, rather than directly opposite each other. By thus "staggering" the welding-points I avoid such weakening of the rail as might occur by having more than one small welding-point in the same vertical plane of the rail.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a rail-joint, a plate having one end permanently secured to the bottom of one rail, space being left between said plate and the longitudinal center of said rail, the opposite end of said plate extending under and detachably supporting the adjacent rail, substantially as described.

2. In a rail-joint, the combination, substantially as described, of two rails, each provided with a truss or plate having one end permanently secured to the bottom of said rail at one side of the longitudinal center of the same, and the opposite end extending under and supporting the adjacent rail, an open space being thus left between the inner vertical walls of said truss or bottom plates.

3. In a rail-joint, the combination, substantially as described, of the rail and a girder or truss plate having one end permanently secured to the bottom of said rail and the other end extending beyond the end of said rail and detachably supporting the adjacent rail, said plate being provided with ribs or projections extending inwardly toward or under the longitudinal center line of the rail and affording central support for the same.

4. In a rail-joint, the combination, substantially as described, of two rails, each provided with a truss or plate having one end perma-

nently secured to the bottom of said rail, one side of the longitudinal center of the same, the other end of said plate extending beyond the end of said rail and forming a support for the adjacent rail, said plates being provided with vertical ribs or projections extending inwardly toward or under the center of the rail and arranged to afford central support for the same.

5. The girder-plates B B' adapted to be secured to the bottoms of adjacent rails, said plates being provided, respectively, with the inward projections b b', said projections alternating with each other, substantially as described.

6. In a rail-joint, a splice-bar constructed for welded attachment to one only of the abutting rails, said bar being provided with a plurality of welding projections grouped nearer to one end of said bar than the other and adapted to form a plurality of welding connections with the same rail, substantially as described.

7. In a rail-joint, the truss or bottom plate B provided with the welding projections d d' with space between them, said projections being adapted to form several welding connections with the same rail, substantially as described.

8. In a rail-joint, a splice-bar constructed for welded attachment to one only of the abutting rails, said bar being provided with a plurality of welding projections grouped nearer to one end of said bar than the other, said projections forming a plurality of welding connections with the same rail, the position of said splice-bar between said projections, and not raised to a welding heat, limiting the compression and regulating the predetermined relative position of said splice-bar and rail when welded together, substantially as described.

9. In a rail-joint, a splice-bar provided with a plurality of welding-points projecting from the surface of said bar and grouped nearer to one end of said bar than the other, portions of said bar being located between said welding projections and not raised to a welding heat, limiting the position of said bar and causing the same to fit the surface or groove of the rail in a predetermined manner, whereby said splice-bar, when welded to the rail, will be proper and exact alinement relatively to the rail or rails, substantially as described.

10. A splice-bar provided with welding points projecting from its surface, said welding-points being located at intervals diagonally opposite to each other, substantially as described.

11. A rail-joint consisting, essentially, of the following elements in combination: two abutting rails, each provided with a truss plate having one end permanently secured to the bottom of said rail and the opposite end extending under and supporting the adjacent rail, space being left between the inner vertical sides of said plates, said girder-

interlocking and detachably supporting each other, fish-plates on opposite sides of said rails and bolts passing through said fish-plates and rails.

12. A rail-joint consisting, essentially, of the following elements in combination: two abutting rails, each provided with a truss-plate having one end permanently secured to the bottom of said rail and the opposite end extending under and supporting the other rail, space being left between the inner ver-

tical sides of said plates, said girder-plates interlocking and supporting each other, and two fish-plates, each rail being provided with one having one end permanently secured to the side of said rail and the other end overlapping the abutting rail, said rails being detachably secured together.

WILLIAM ROBINSON.

Witnesses:

JAS. W. RIPLEY,
CHAUNCY C. ALLEN.

No 616,436

H. F. A. KLEINSCHMIDT.
ELECTRIC WELDING.

Patented Dec. 20, 1899

(Application filed Feb. 7, 1898.)

No Model.

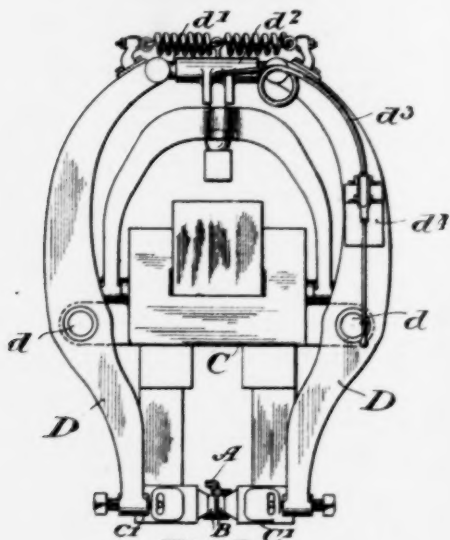


Fig. 1.

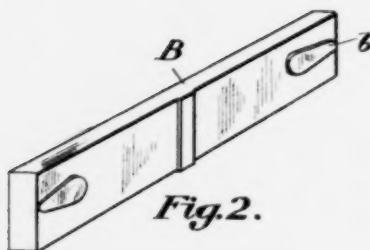


Fig. 2.

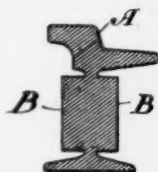


Fig. 3.

WITNESSES:

C. F. Kuss Jr.
H. C. H. K.

INVENTOR
H. F. A. Kleinschmidt
BY
Richard L. L.
ATTORNEY

UNITED STATES PATENT OFFICE.

HENRY F. A. KLEINSCHMIDT, OF JOHNSTOWN, PENNSYLVANIA, ASSIGNOR,
BY DIRECT AND MESNE ASSIGNMENTS, TO THE LORAIN STEEL COM-
PANY, OF OHIO.

ELECTRIC WELDING.

SPECIFICATION forming part of Letters Patent No. 618,436, dated December 20, 1898.

Application filed February 7, 1898. Serial No. 669,352. (No model.)

To all whom it may concern:

Be it known that I, HENRY F. A. KLEIN-
SCHMIDT, of Johnstown, in the county of Cam-
bria and State of Pennsylvania, have invent-
ed new and useful Improvements in Electric
Welding, of which the following is a full,
clear, and exact description, reference being
had to the accompanying drawings, which
form a part of this specification.

This invention (Case A) relates to electric
welding; and it is my object to provide a
novel method for the same by which I am en-
abled to effect a highly-efficient weld without
deteriorating the qualities of the steel and
without subjecting the same to severe cooling
strains.

The apparatus which I have shown and
will describe by which my method can be put
into effect is especially applicable for weld-
ing splice-bars to rails for the construction of
what is known as "continuous railway-track;"
but as my invention is also applicable for
welding other products I do not desire to limit
myself to the welding of continuous rails.

Ordinarily methods of welding tend to de-
stroy the toughness of the metal, because the
high heat renders the metal crystalline, and
the subsequent upsetting causes the coarse
crystals to separate and weaken their hold
upon each other. In certain classes of weld-
ing, such as when a member is welded to the
side of a rail, very severe strains are set up
in the rail by the irregular heating and cool-
ing and the sharp local contrasts in the tem-
perature of the metal. This often causes the
rail to break below its normal strength. In
this same class of welding the burning of the
metal under high heat often leaves cavities
therein, which are not effectually closed by
the ordinary process of upsetting. My inven-
tion is designed to obviate all of these trou-
bles; and it consists in upsetting and simul-
taneously compressing the metal as soon as
it is heated to the desired temperature and
then retaining said metal under compression
and in contact with cold metallic surfaces un-
til the metal has become sufficiently cold to
be deprived of nearly all of its plasticity.

Referring to the drawings, Figure 1 shows
an apparatus for welding continuous rails in

the street. Fig. 2 shows a splice-bar which is
well fitted for use with my improved method.
Fig. 3 shows a cross-section of a completed
weld between two splice-bars and a rail, taken
on a line which would pass through one of the
bosses *b*.

A is the rail to which the splice-bars are to
be welded.

B are the splice-bars.

C is a stationary electric transformer, hav-
ing terminals C', adapted to engage the out-
side of the splice-bars.

D are arms which engage the back of the
terminals C', are pivoted at *d*, and are con-
nected at their upper ends to plungers *d'*,
moving in a cylinder *D'*, which receives wa-
ter through pipes *d''*, connected with a hand-
pump *d'''*.

In welding the bosses *b* to the rails the
splice-bars are laid against the side of the rail
and the terminals C' brought to the position
shown in Fig. 1. Current is then passed
transversely through the rail and the splice-
bars until a suitable temperature has been
reached, when the pump *d'* is operated and
the terminals C' moved toward each other
with a heavy pressure. The bosses *b* extend
only a very short distance from the main
body of the bar, so that they will not prevent
the bar from making close engagement with
the rail and so that any tendency which they
may have to bulge out will be prevented by
the rapid cooling and compression to which
they are subjected. After upsetting such a
weld, whether with light or with heavy pres-
sure, it has been usual to immediately relieve
the pressure and remove the transformers
from their contact with the bars. In accord-
ance with the present invention, however,
the pressure is retained at its maximum for a
considerable time, and I have found that this
is of the utmost importance. This time will
vary under different conditions but should
last until the temperature has fallen suffi-
ciently to remove any considerable degree of
plasticity. I find that it is usually safe to
remove the pressure if the temperature has
fallen sufficiently so that there is practically
no glow given off by the cooling metal.

In the specific case shown the rail is about

six inches high and is about eight square inches in cross-section. The pressure used is about twenty-five thousand pounds, and it is necessary for the best results to retain the metal under this compression for about two minutes after the heating-current has been shut off. I do not, however, desire to limit myself to these specific details, which I have only set forth as showing what I have found to be a preferred length of time for a particular form and size of weld.

I do not lay claim in this application to the form of splice-bar which I have shown and described, for this forms the subject-matter of an application for Letters Patent filed by me of even date herewith and serially numbered 669,353.

What I claim, and desire to protect by Letters Patent, is—

1. The method of electrically welding bars to the sides of rails which consists in passing the heating-current transversely through the

bars and rail, forming the weld by laterally compressing the bars against the rail, and retaining the bars continuously under compression and in contact with relatively cold metal surfaces until said bars have cooled sufficiently to substantially remove their plasticity.

2. The method of electrically welding bars to the sides of rails which consists in passing the heating-current transversely through the bars and rail, forming the weld by laterally compressing the bars against the rail, and retaining said bars continuously under compression and in contact with cold conducting surfaces until they have cooled sufficiently to have lost substantially all appearance of glow.

In testimony whereof I have affixed my signature in presence of two witnesses.

HENRY F. A. KLEINSCHMIDT.

Witnesses:

RICHARD EYRE,
MYRTLE E. SHARPE.

No. 647,694.

Patented Apr. 17, 1900.

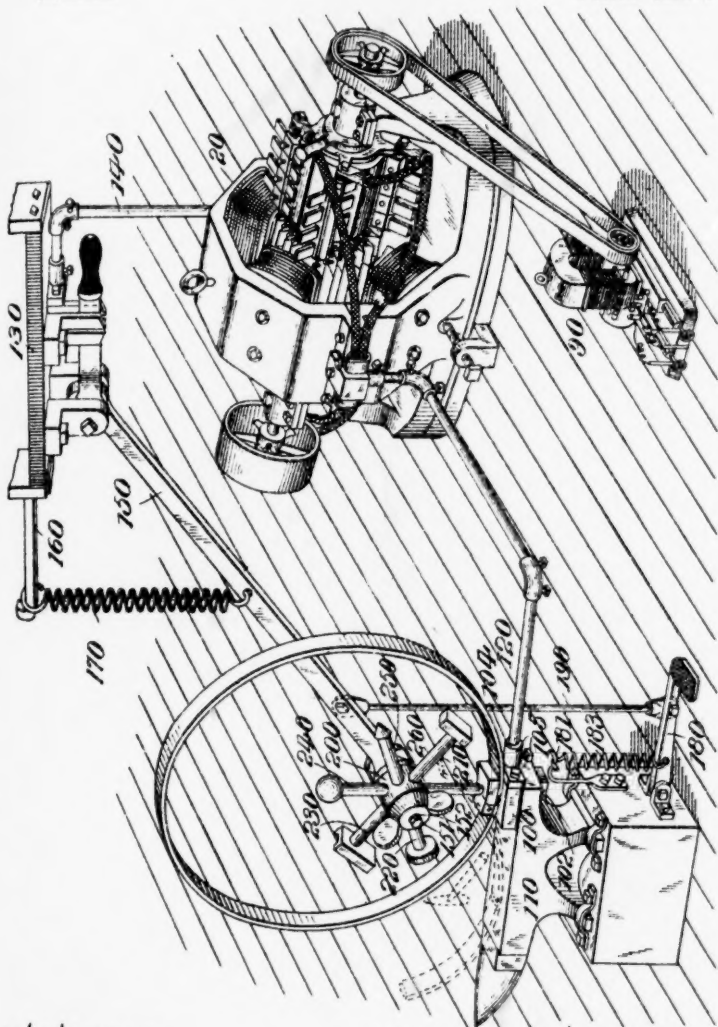
G. D. BURTON.

ELECTRIC METAL WORKING APPARATUS.

(Application filed Aug. 11, 1898.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES
S. M. Smith
P. W. Chew

FIG. 1

INVENTOR
G. D. Burton
G. F. Jones
Attorney

No. 647,694.

Patented Apr. 17, 1900.

G. D. BURTON.

ELECTRIC METAL WORKING APPARATUS.

(Application filed Aug. 11, 1898.)

2 Sheets—Sheet 2.

(No Model.)

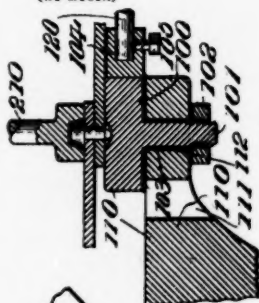


Fig. 13

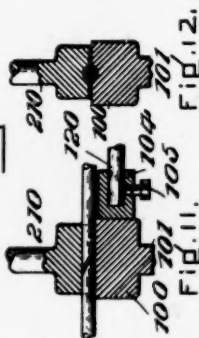


Fig. 12.

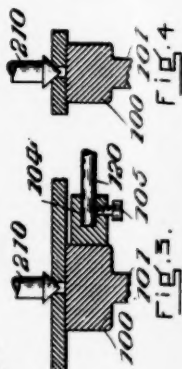


Fig. 4

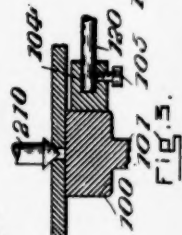


Fig. 5.

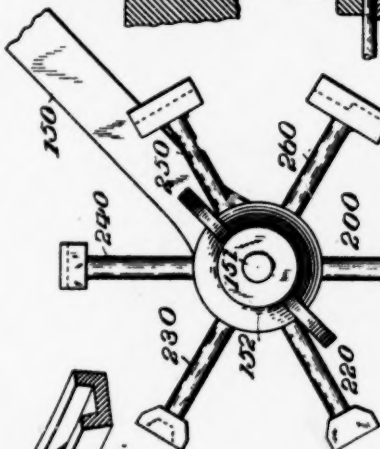


Fig. 2.

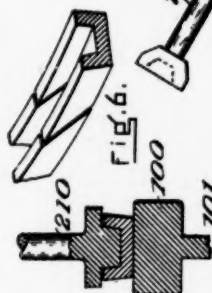


Fig. 6.

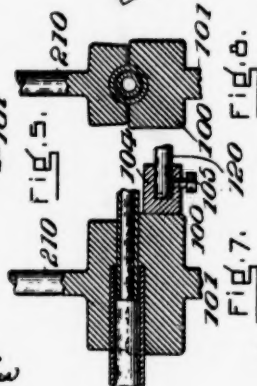


Fig. 7.

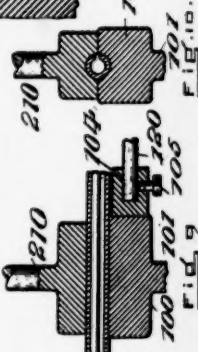


Fig. 8.

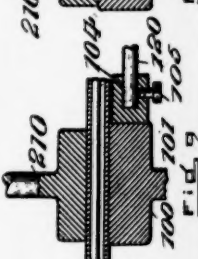


Fig. 9

WITNESSES

S. M. Bonnett
Philip W. Chew

INVENTOR

G. D. Burton
H. B. Somes
Attorney

UNITED STATES PATENT OFFICE.

GEORGE D. BURTON, OF BOSTON, MASSACHUSETTS.

ELECTRIC METAL-WORKING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 647,694, dated April 17, 1900.

Application filed August 11, 1898. Serial No. 688,382. (No model.)

To all whom it may concern:

Be it known that I, GEORGE D. BURTON, a citizen of the United States of America, residing at Boston, in the county of Suffolk, in the State of Massachusetts, have invented certain new and useful Improvements in Electric Metal-Working Apparatus, of which the following is a specification.

This invention relates to electric metal-working apparatus for the forging, welding, and brazing of metals and for heating metal articles, such as wheel-tires, for the purpose of setting them.

The invention is especially adapted for lap-welding by the use of a primary transverse current. The lap weld is superior to the butt-weld. No end pressure is required, and consequently there is no upsetting of the metal and no formation of a bulge or projection at the joint, which is afterward required to be filed or hammered down.

The object of the invention is to provide a simple, convenient, and compact apparatus for the use of a blacksmith or other metal-worker.

Figure 1 of the accompanying drawings represents a perspective view of this apparatus. Fig. 2 represents, on an enlarged scale, a front elevation of the rotary electrode-head, having a plurality of electrodes for a variety of purposes, and a vertical longitudinal section of a portion of an anvil supporting the opposite electrode, a piece of work to be lap-welded being disposed between the electrodes.

Fig. 3 represents a longitudinal section of an anvil-electrode and a fragment of one of the wheel-electrodes adapted for countersinking screw-holes. Fig. 4 represents a transverse section thereof. Fig. 5 represents a vertical section of anvil and wheel electrodes, clamping between them a section of a grooved metallic portion of a vehicle-tire adapted for receiving a rubber tire. Fig. 6 represents a perspective view, preparatory to lap welding, of the lapping ends of the metallic portion of a vehicle-tire adapted to receive a rubber tire. Fig. 7 represents a vertical longitudinal section of wheel and anvil electrodes adapted for lapwelding the joint between two pipe-sections of different sizes. Fig. 8 represents a transverse section thereof. Fig. 9 represents a longitudinal vertical section of

wheel and anvil electrodes adapted for brazing or welding a longitudinal slit in a metallic tube. Fig. 10 represents a transverse section thereof. Fig. 11 represents a longitudinal vertical section of anvil and wheel electrodes adapted to form a lap-weld between two bars of metal. Fig. 12 represents a transverse section through the lap-weld joint. Fig. 13 represents a vertical longitudinal section of one end of the anvil and of wheel and anvil electrodes adapted for riveting.

The same reference-numbers indicate corresponding parts in all the figures.

The electric current for use in this apparatus may be taken from any suitable source of electricity. I have devised for this purpose a dynamo-electric generator of peculiar construction which has a wide range of current as regards both amperage and voltage and which will supply a primary current of large volume and low voltage, thus avoiding the use of a transformer. The dynamo herein illustrated is of this sort; but as it will constitute the subject-matter for a separate application for a patent it is not deemed necessary to herein describe it in detail.

An exciter-dynamo 90 is employed in connection with the generator-dynamo 20 for exciting the field of the latter, said exciter-dynamo being properly connected with the field-magnets of the generator by wires (not shown) and a rheostat being arranged in the field-circuit of the exciter for regulating the excitation of the field of the generator, as in United States Patent No. 475,232 to Burton, Eddy, and Briggs, dated May 17, 1892.

A bed-electrode 100, constituting one of the working terminals of the circuit, is supported on an anvil, as the blacksmith is accustomed to the use of the anvil and this arrangement suits his convenience, and the loss of heat incident to the transferring of the work from the ordinary forge to the anvil is avoided. The anvil herein shown consists of an ordinary anvil 110, which is provided at its rear end with a square vertical slot 111 and a round vertical slot 112. In this instance the round slot is shown as the one utilized for connecting the bed-electrode with the anvil. For this purpose the bed-electrode 100, as shown in Figs. 1 and 2, comprises a block of highly-conductive material, such as copper,

provided with a downwardly-projecting stud 101, which extends through the hole in the anvil. The lower end of this stud is screw-threaded, and the nut 102 operates to clamp the electrode to the anvil. Any other suitable means may be employed for fastening the electrode to the anvil. The electrode is preferably insulated from the anvil by any suitable insulating material 103, such as fiber board or mica; but it is not absolutely necessary to provide this insulation, as the current used is low in voltage and the conductivity of the electrode is much higher than that of the anvil. This electrode is provided with a socket 104, having a binding-screw 105, and a conductor 120, which may consist of a bar of copper, connects said electrode with one pole of the generator-dynamo. A switch-block 130 is connected by conductor 140, also preferably composed of a bar of copper, to the other pole of the generator-dynamo.

An arm 150 is hinged to the switch-block 130 and carries at its free end a rotary electrode-head 200, having a plurality of radial arms, as 210, 220, 230, 240, 250, and 260, said arms carrying electrodes of different shapes adapted for different purposes. The electrode-head 200 is clamped to the hinged arm 150. The arm, as shown, is provided with a lateral stud 151, on which the hub of the electrode-head is adjusted, and a clamping-nut 152 on said stud holds said electrode-head in place. The electrode-head may therefore be readily removed, and another having electrodes of different shapes may be substituted therefor. An elastic support is provided for said arm, preferably in the form of a spring 170, having one end connected with a bar 160, extending from the switch-block, and connected at its other end with the hinged arm 150. This spring serves to normally support the hinged arm in such position that the electrodes of the electrode-head 200 will be above the electrode 100 on the anvil. The hinged arm is composed of conductive material, and the spring is insulated therefrom. A foot-lever 180 is hinged to the anvil or at any suitable point, and a connecting-rod 190 is connected at its upper end with the conductive hinged arm 150 and at its lower end with the foot-lever. This connecting-rod is insulated from the hinged arm. A spring 183, connected with a bracket 181 and with the foot-lever, tends to hold the foot-lever in elevated position. The spring 170 for supporting the hinged arm 150 is preferably so adjusted as to hold the arm in such position that the electrodes on the rotary head are held normally out of contact with the bed-

electrode 100 on the anvil and to lift said electrode out of contact with the work when the foot lever is released.

The bed-electrodes 100 are made in a variety of shapes and are interchangeable to correspond with the electrodes of the electrode-head 200 for different kinds of work.

In the use of this apparatus the pieces to be lapwelded are adjusted or placed with their ends overlapping on the bed-electrode 100. Then the foot-lever is depressed, and one of the electrodes of the electrode-head is brought into contact with the work, whereby the circuit is closed and the current passes through the work in transverse direction across the overlapping ends of the parts to be heated. The current may pass in either direction from the generator and effect the result equally well. As soon as the piece is heated to the proper temperature, which may be ascertained by inspection thereof, the operator releases the foot-lever and the spring 170 lifts the hinged lever 150 and takes the upper electrode out of contact with the work, whereby the circuit is broken. Then the operator may shove the work forward on the anvil and hammer the joint or otherwise finish it, as desired. In this way the heating can be quickly and conveniently effected on the anvil without loss of time and heat and without forming an objectionable bulge in the work.

Any suitable block or bench capable of use in hammering, forging, or finishing metal may be considered as the anvil.

I claim as my invention—

1. In an electric metal-working apparatus, the combination of an anvil provided with a slot, a bed-electrode supported on said anvil and provided with a stud engaging said slot, said electrode being connected with one electric pole, and a swinging electrode supported above said bed-electrode and connected with the other electric pole.

2. In an electric metal-working apparatus, the combination of an anvil, a bed-electrode supported on said anvil and connected with one electric pole, a swinging arm carrying an electrode connected to the other electric pole, a rigid arm supported above said swinging arm, a spring connecting said rigid arm with said swinging arm and imparting an elastic support thereto, and a foot-lever connected with said swinging arm for swinging it into operative position.

GEO. D. BURTON.

Witnesses:

E. F. PHILIPSON,
GEO. STEINER.

No. 670,808.

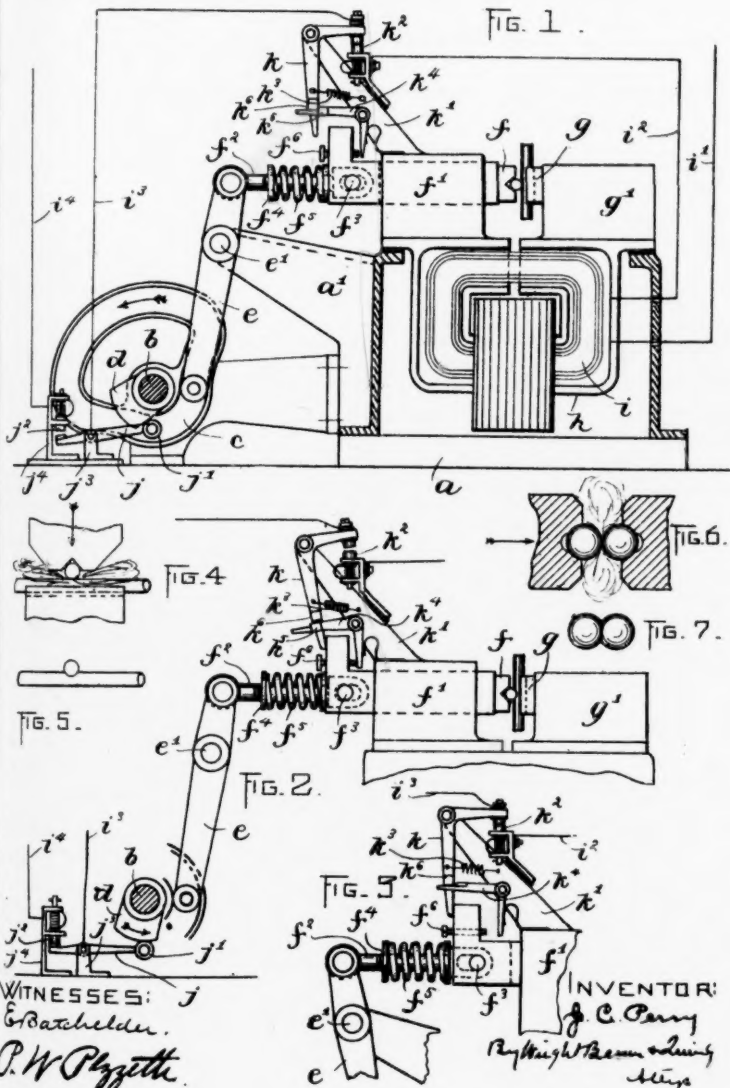
Patented Mar. 26, 1901.

J. C. PERRY.

METHOD OF ELECTRIC WELDING.

(Application filed Sept. 18, 1899.)

(No Model.)



UNITED STATES PATENT OFFICE.

JOHN C. PERRY, OF CLINTON, MASSACHUSETTS.

METHOD OF ELECTRIC WELDING.

SPECIFICATION forming part of Letters Patent No. 670,808, dated March 26, 1901.

Application filed September 16, 1899. Serial No. 730,554. (No specimens.)

To all whom it may concern:

Be it known that I, JOHN C. PERRY, of Clinton, in the county of Worcester and State of Massachusetts, have invented certain new and useful improvements in Methods of Making Welds Electrically, of which the following is a specification.

This invention relates to a new and improved method for making welds electrically.

Reference is to be had to the accompanying sheet of drawings, forming a part of this specification, in which like characters of reference are used to indicate like parts wherever they occur.

Figure 1 represents in side elevation a section of a machine embodying my invention and shows a transformer, the pressure device, and the switches, and also the connecting-wires for completing the primary circuit.

Fig. 2 represents in side elevation a detailed view of the machine, showing the position of the automatic switches after the completion of the weld. Fig. 3 is a substantially similar view showing the plunger in position to reset or lock in position the automatic circuit-breaker.

Fig. 4 represents two parts when being welded together, with the envelop of vapor surrounding the joint exaggerated for the purposes of illustration. Fig. 5 shows the parts after the weld is completed.

Fig. 6 represents two spherical bodies in the act of being welded. Fig. 7 shows the same when the weld is completed.

By my invention the welds are made instantaneously without any appreciable heating of the material adjacent to the point of the weld, and my improved method consists in the simultaneous application to the parts to be joined or welded of a mechanical pressure nearly equal to the crushing strength of the material and a current of electricity of relatively enormous volume. By using a mechanical pressure nearly equal to the crushing strength of the material I insure the parts being forced together the instant they soften, and by the employment of a current of electricity of relatively enormous volume compared with the area of contact of the parts to be welded I am enabled to produce an instantaneous heating or softening of the metal. The welding-current is much stronger than has heretofore been considered suitable, be-

ing from one to two hundred thousand amperes to a square inch, while the mechanical pressure of the electrodes for forcing the heated parts together is nearly equal to the crushing strength of the material being welded when cool. As a result of this the parts to be welded are first brought into intimate contact, and immediately thereafter the circuit is closed between the electrodes. The current is of such strength that the contacting parts of the said members become heated to a fusing-point immediately, and as soon as the metal sufficiently softens, so that its resistance is less than the force of the compression spring or weight, such spring or weight forces the movable electrode farther toward the stationary electrode to weld the parts together. Immediately after this compression the circuit is broken and before the heat is spread away from the contacting surfaces. Consequently the metal cannot be overheated or blown out. As the electrodes are relatively of large volume or area compared to the contacting metal to be welded, there is no necessity for artificial cooling. Further, by my invention two parts covered with a coating of metal fusible at a lower temperature than said parts can be readily welded—as, for instance, iron wire covered with a coating of zinc, as shown in Figs. 4 and 5. When the said parts to be welded are brought into contact, their contacting surfaces are of a relatively small area at the beginning of the operation and the area increases as the metals are compressed together.

It is obvious that since the coating of the parts to be joined is fusible at a temperature lower than the fusing-point of the body coated thereby said covering will be volatilized if the welding operation consume any considerable portion of time, and the covering at the weld will be removed and in case of iron the exposed part liable to rust. In accordance with my invention, however, the weld is practically instantaneous and the heat is localized at the point of contact between the two parts, so that only the coating at the point of contact is volatilized or disturbed, thus forming an envelop surrounding the weld, as portrayed in Figs. 4 and 5, to prevent access of air thereto and consequent oxidation, the rapidity of the weld being such that the heat

does not spread through the coating over such surfaces as are not brought into contact and welded together. The circuit is broken immediately upon the completion of the weld, so that the envelop of gas or vapor is chilled instantaneously and a portion of the said coating material is redeposited at the joint, oxidation being prevented by the outside portions of this vapor or gas. When heavy welds are made by this process, so that the fillet or bur of highly-heated metal is forced out of the joint, it is covered when of iron by a thin film of magnetite or magnetic oxid and is rust-proof.

As stated, in following out my process or method all of the contacting portions of the electrodes are made very large to permit the flow of the heavy current over the parts to be welded without injuring the covering of zinc or other material and also to assist in keeping the parts adjacent to the weld cool. By my invention the joints formed by the weld when the parts have the described coating are fully covered and protected by the zinc covering, for when two bodies covered with a coating fusible at a relatively low temperature are welded together by my method the covering is practically uninjured about the joint, and the joint is thus rust-proof. Further, by my invention two parts (of which one is under tension) can be readily welded, for, although the abutting or contacting portions thereof reach a high temperature for an instant, the heat is localized about said surfaces and does not extend through the entire body of the said parts, thus preventing the body from being stretched, elongated, or bent at the weld or dominated by the described stress or strain, as would be the case if the welding operation were continued, as was done prior to my invention, over such a period of time that the entire body of the metal became heated and softened, so that it would be affected by such stress or strain, for by my invention merely the contacting surfaces are softened.

While my invention may be carried out in many ways, I prefer for simplicity of construction the means shown in the drawings, which are herein illustrated in order to disclose the mechanism by which my improved method may be practiced.

a represents a part of the framework of the machine, said frame being formed in any desirable way and supported upon suitable legs or standards; but inasmuch as the construction of the framework forms no material part of my invention it is unnecessary to describe it in detail.

b indicates a shaft which is driven in any suitable way and on which is secured a path-cam c and also a cam d . The path-cam actuates a lever e , fulcrumed at e' on a bracket a' , forming a part of the framework, said lever being constructed and arranged to cause the actuation of a movable electrode f . Said electrode f , together with that indicated at g , is mounted in a suitable manner upon and insu-

lated from the framework. The brackets f' g' , which support said electrodes, form a part of the secondary circuit (indicated at h) and the primary circuit, including the coils i and the wires j^1 j^2 j^3 . The movable electrode f is connected to the upper end of the lever e by a connecting-rod f^2 , which is slotted at its end to receive the pin f^3 , passed crosswise through the plunger, of which the movable electrode forms a part, and between the end of the plunger and a collar f^4 , adjustably secured upon the rod f^2 , there is a powerful compression-spring f^5 .

When two parts to be welded together according to my invention are placed between the electrodes and the cam c actuates the lever e , the electrodes clamp the said parts with a pressure a little less than the crushing strength of the metal of which the parts are formed, the spring f^5 being compressed when the resistance of the said parts becomes greater than the strength of the said spring, and after the contacting surfaces of the parts become softened the spring f^5 instantly and automatically forces the said parts into intimate contact to complete the weld, as shown in Figs. 5 and 7, and thus automatically breaks the circuit.

I so arrange the apparatus that the primary circuit is closed immediately after the clamping of the parts between the electrodes, and the circuit is broken when the movable electrode is pushed forward after the metal has become sufficiently softened to complete the weld or pushed to the limit of its forward movement, the whole operation taking place in a very short duration of time and the weld being practically instantaneous.

The circuit-closer is actuated automatically from the shaft b by the cam d , and it consists of the switch-lever j , having a roller j^1 bearing against said cam d and having its other end adapted to bear against the sufficiently-yielding contact j^2 . The movable contact or switch-lever j is fulcrumed on a bracket j^3 , suitably mounted on the framework, while the yielding stationary contact j^2 is supported in a bracket j^4 . It is understood, of course, that the brackets in the lever j are suitably insulated from the rest of the machine, being included in the primary circuit.

The circuit-breaker is operated automatically by the movable electrode, as previously stated, and comprises the following elements: An elbow-lever k is fulcrumed upon a bracket k' , supported by and insulated from the bracket f' , and it constitutes a movable contact being connected with the wire j^2 , and consequently with the switch-lever j . The stationary yielding contact k^2 is supported upon and insulated upon the bracket k' and is electrically connected with the wire j^3 . A spring k^3 tends to break the circuit or to move the movable contacts from the stationary contacts k^2 ; but this tendency of the springs is overcome or prevented by a second elbow-lever k^4 , fulcrumed upon the bracket k' and

- having a knife-edge k^2 , which engages a similar edge k^4 on the end of one of the arms of the elbow-lever k . The lever k^4 has an arm projecting downwardly into the path of an adjustable screw f^1 on the movable plunger or electrode f , and the parts are so adjusted at the final movement of the movable electrode upon the softening of the parts to be welded that the adjusting-screw f^1 engages the lever k^4 and disengages it from the movable switch-lever k , so that it permits the spring k^3 to break the circuit by swinging the movable contact away from the stationary contact k^2 .
- 15 Manifestly the parts of the mechanism before described may be variously modified, and my improved method may be followed in making welds of various kinds without departing at all from the spirit or scope of my invention, which consists, as heretofore stated, in the simultaneous application to the parts to be joined of a mechanical pressure nearly equal to the crushing strength of the material and a current of electricity of relatively enormous volume.

This invention, as stated, I believe to be broadly new with me, and I desire to claim and to be understood as claiming the same in the broadest possible manner.

- 30 Having thus explained the nature of my invention and described a way of constructing and using the same, though without attempting to set forth all of the forms in which it may be made or all of the modes of its use, what I claim, and desire to secure by Letters Patent, is—

1. The method of making welds electrically, consisting of the simultaneous application to the parts to be joined of a mechanical pressure nearly equal to the crushing strength of the material to be welded, and of a current of electricity of relatively enormous volume, and subsequently and automatically breaking the circuit.

2. The method of welding coated wire which consists in localizing the heat at the point of contact to form about the joint a protective envelop of gas from the coating at the point of contact, and completing the weld while the joint is protected by said envelop and before the coating about the joint is destroyed.

3. The method of electrically welding parts having a coating of a relatively low melting temperature, which consists in applying to said parts a relatively enormous pressure, applying a current of electricity to said parts at their point of contact of relatively enormous volume and arranging said pressure to automatically force said parts together after the material softens, and thereafter break the circuit to volatilize the coating at the point of contact, to form an envelop about the weld and complete the weld before the heating action extends beyond the point of the weld or joint sufficiently to destroy the coating surrounding the joint.

In testimony whereof I have affixed my signature in presence of two witnesses.

JOHN C. PERRY.

Witnesses:

E. BATCHELDER,
CORNELIUS BEARD, Jr.

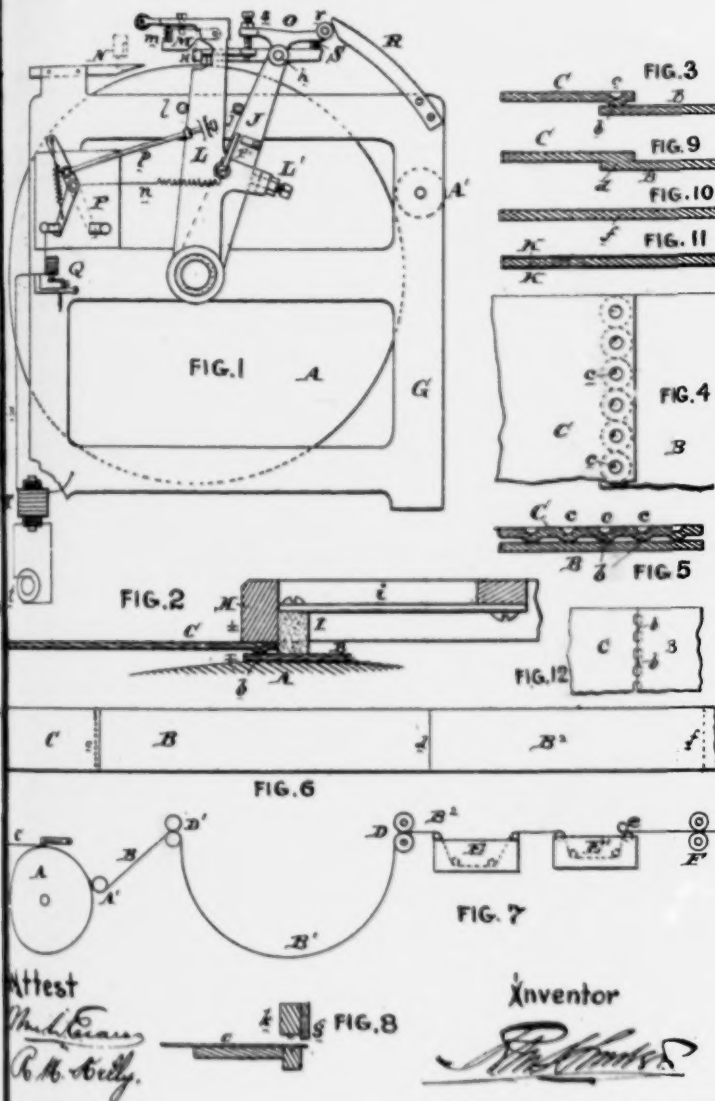
No. 690,958.

Patented Jan. 14, 1902.

R. M. HUNTER.
METHOD OF ELECTRIC WELDING.

(Application filed Apr. 9, 1898.)

(No Model.)



Attest
Wm. C. Kelly
C. H. Kelly

Inventor

R. M. Hunter

UNITED STATES PATENT OFFICE.

RUDOLPH M. HUNTER, OF PHILADELPHIA, PENNSYLVANIA.

METHOD OF ELECTRIC WELDING.

SPECIFICATION forming part of Letters Patent No. 690,958, dated January 14, 1902.

Application filed April 7, 1898. Serial No. 676,756. (No model.)

To all whom it may concern:

Be it known that I, RUDOLPH M. HUNTER, of the city and county of Philadelphia, State of Pennsylvania, have invented an Improved
 5 **ment in Methods of Electric Welding**, of which the following is a specification.

My invention set out in this application (Case 304) has reference to the manufacture of sheet metal in long lengths by electric
 10 welding; and it consists of certain improvements which are fully set forth in the following specification and shown in the accompanying drawings, which form a part thereof.

Heretofore it has been customary to make
 15 long lengths of sheet-tin for roofing by connecting the smaller sheets end to end by folded joints; but this has objection from the fact that it forms a heavy seam and is not always proof against leakage. Furthermore,
 20 sheets of metal of this character cannot be employed in such industries as the manufacture of sheet-metal cans, pans, &c.

The object of my invention is to provide a method of making continuous lengths of
 25 sheet metal, plain, tinned, or coated, and adapted for roofing and general manufactures, the said sheets being without seams and liquid-tight throughout.

In carrying my invention into practice I
 30 first manufacture a series of sheets of iron or steel of the requisite width, and these I arrange, two or more, end to end and unite them by electric welding. The welded joints may be subsequently run through cold-plate
 35 rolls and the said welded joints rolled down to the same thickness as the rest of the sheet-plate. This sheet metal may then be coated or tinned and finally passed between planishing-rolls, if so desired. The welding of the
 40 sheets of iron or steel together is an important feature of my invention, and in carrying out this part of my improvements I provide one end of the sheets with a series of projections, which may be formed by dies and
 45 arranged in a transverse line at or adjacent to one end of the plate. When these projections are placed upon or in contact with the other end of the next adjacent sheet, we will have an electrical contact made between the
 50 two plates or sheets at a series of separate and preferably equidistant points and adapt-

ed for offering a very material resistance. When these plates are pressed into contact and a current of electricity passed from one plate to the other, the welding operation begins at each of the points of contact, and as the metal in the immediate vicinity of the projections on the two plates melts small
 lakes of molten metal are formed, which quickly spread and unite, making a full transverse weld. Under ordinary conditions of simply lapping the edges and passing a current through from plate to plate the welding would be a failure, since it is impossible to properly control the action of the current and portions would melt and flow away before other parts are welded at all. By my improved method, however, I set up a simultaneous series of gradually-extending welds, which ultimately unite, and thus make it possible to properly unite the two sheets. When the weld is being made, the plates are pressed together as the metal becomes fused. Broadly considered, my invention comprehends the union of two sheets of metal in this manner
 irrespective of the purposes to which it may subsequently be put.

My invention will be better understood by reference to the accompanying drawings, in which—

Figure 1 is a side elevation of a sheet-metal-welding machine embodying my invention. Fig. 2 is an enlarged sectional elevation of a portion of same. Fig. 3 is a longitudinal section of the lapped sheets before welding. Fig. 4 is a plan view of a portion of same. Fig. 5 is a cross-section of same on the line of the projections. Fig. 6 is a plan view of a long sheet in process of being made by my process. Fig. 7 is an elevation showing my complete apparatus for welding, rolling, and coating diagrammatically. Fig. 8 is a sectional elevation of an apparatus for preparing the ends of the sheets before being welded. Fig. 9 is a longitudinal section of the welded sheets. Fig. 10 is a similar view of the joint after cold-rolling. Fig. 11 is a similar view after the plate has been coated or tinned, and Fig. 12 is a plan view of a modified form of plate-joint for welding.

A is the welding-machine for uniting the sheet C to the rear end of the sheet B. The

long length of sheet metal comprises the portion B', which is fed in the form of a loop by feed-rolls D' and has its joints welded, as indicated at *d* in Fig. 9, and the portion B², which has passed through the cold-press rolls D and has its joints reduced to the condition of *f*, Fig. 10, having a uniform thickness with the rest of the sheet. The sheet so prepared may then be coated or plated in any suitable or well-known manner. In Fig. 7 I have shown it as being fed through a bath E of acid to cleanse it and thence through the tinning or galvanizing bath E'. The excess of the coating metal is rubbed off by the rolls *e*, and after cooling it may pass through planishing-rolls F. It is evident that the bath E' may be an ordinary copper-plating bath, if so desired, as will be well understood. The loop B' enables the sheet to be continuously drawn through the press-rolls D and permits the intermittent action of the welding-machine. The rolls D' act as a support arranged in alinement with the face of the horizontal press-rolls D and intermediate of said rolls and the welding means. The loop B' compensates for any variation in the length of the sheet between the welding-machine and press-rolls. It also secures a regular and uniform action in the baths E E'. The coating material, whether it be paint, size, tin, or copper, is indicated in Fig. 11 at K.

I will now describe the welding mechanism. The cylinder A is journaled in a main frame G, and the new sheets to be added are guided by a table N and fed under the clamp H. The clamp H is pivoted at *h* to an arm J, which is in turn pivoted concentrically with the axis of the cylinder A.

I is a block of slate carried on a spring-arm i, secured to the clamp H and is adapted to normally be held down below the clamp, so as to act as a stop or guide to receive the end of the metal sheet C to be welded and at the same time hold down the rear end of the previous sheet B. Pivoted at *h* on the end of the arm J is a head O, having a rear arm provided with a roller *r*, adapted to run under the guide R on the main frame, and a forward arm furnished with a set-screw *s* to limit the upward movement of the clamp H. A spring S is interposed between the rear end of the clamp H and the head O under the roller *r* and operates to throw up the clamp and guide on the return stroke and also to make the roller *r* follow the cam R.

L is a second pivoted arm, having its pivot concentric with the arm J and cylinder A. This arm L is adapted to be rocked or reciprocated by hand. It is provided with a stop L', which acts upon the arm J, so that when the arm L is pulled back it draws the arm J with it.

M is a cam pivoted to the arm L and is pressed downward by a spring *m*. In the positions shown in Fig. 1 a stop *j* acts to limit the movement of arm J, and a stop *l* may be used to limit the arm L, though this is hardly

necessary in view of the use of the stop L'. The parts J, L, and R are insulated from the main frame.

P is a snap-switch for opening the electric circuit and is operated by a rod *p*, connecting with the arm L. This snap-switch consists of two arms pivoted together and having their free ends connected by a spring. One of the arms is connected with the rod *p*, and the other acts as the circuit-closing contact. When the arm L is moved to the right, the rod *p* is moved to the right until the spring passes beyond the pivot of these arms, when the spring snaps the lower arm over into the dotted position to open the circuit. In closing the circuit the reverse operation occurs.

P' is a circuit-closing switch, part being on arm J and part on arm L.

The electric current from an alternating-current dynamo *t* is transformed by a transformer or induction-coil T into a current of very low tension and great volume, and this is delivered to the main frame G or cylinder A and to the arm J by switch P' and circuit *n*, including the switch P.

The forward ends of the sheets C are prepared in the following manner: The edge is trimmed by shear *g*, and the surface near that edge is formed with a series of projections *b* on one side and depressions *c* on the other, as shown by dies *k*, Fig. 8, or in any other suitable manner. When this end of the sheet C is placed upon the rear end of plate B, we have the construction shown in Figs. 2, 3, and 5. It is evident that the die and shear shown in Fig. 8 may be arranged at N, Fig. 1, in proper position to secure the proper feeding of the sheet.

The operation of the welding-machine will now be understood. The parts being in the positions shown in Fig. 1, the sheet C is thrust in upon the end of the sheet B. The arm L is then moved to the right, causing the cam M to ride over the clamp H and press it firmly down upon the plate C with an elastic pressure. The parts are then in the position shown in Fig. 2. In coming to this position the arm L moves the switch P' to close the secondary circuit *n*, causing the electric current to pass between H and A and between the plates B C by contacts *b*. As the arm L is moved farther to the right its upper part strikes the forward part of the head O and moves the arm J backward. The roller *r* passes under the cam R, compressing the spring S and raising stop *s*. When the welding is completed, the arm L opens the snap-switch P and is then moved to the left. This action releases the clamp H from the cam M, and under the effect of the spring S the clamp H is moved away from the cylinder A. At this time the weld is as shown in Fig. 9. The clamp has raised sufficiently to clear the guide-stop *l* of the forward edge of sheet C. The movement of the arm L to the left moves the arm J with it through part L', and the several portions of the apparatus return to the posi-

tions shown in Fig. 1. The sheet B, with the addition C, is then moved under roller A' and through feed-rollers D', and the operation is repeated with a new sheet. When the arm L first moved to the right to operate the clamp H by the cam M, it immediately closes the switch P and put on the current. When a small movement to the right of both arms L and J was made, the switch P automatically snapped open to break the current to stop the welding. In the reverse movement the arm L opens the switch P and subsequently closes the switch P to bring them into position for a new operation. As the welding operation takes place the pressure of the spring *m* causes the clamp H to force the plates C B together as the projections *b* become fused into the surface of the plate B.

An overload-switch Q may be employed to automatically open the circuit when the maximum current flows, so as to prevent any possibility of the lapped body portion of the sheets becoming melted or fusing. The transformer T may be operated on constant-potential mains and have a maximum capacity which may accord with the capacity of the switch Q. This switch Q operates to open the secondary circuit *n* when a sufficiently large current passes through it, said current being dependent upon the resistance presented by the lapped sheets through which the current must pass. As the welding progresses the resistance of the joint decreases and more current flows in the circuit *n*. When this current reaches a maximum, the magnet of the switch Q operates its armature and releases the spring-actuated circuit-closing switch. This prevents abnormal fusing at the welded joint.

It is to be understood that in carrying out this welding operation my invention comprehends the same method whether the points of contact are upon the sides or edges or upon both plates, as the invention comprehends, broadly, the preliminary forming of points or surfaces of contact of less area than the whole surface to be welded and securing the welding operation by causing them to become fused as a preliminary operation to the complete weld. In this manner the weld may be made upon plates butted together, as shown in Fig. 12, the projections or points of contact being upon the edges of one or both plates. In this case the edges are pressed together, as in the other case, during the welding operation. Alternating or direct current may be used, as desired. Plates or sheets of metal united in this manner may be used as roofing-plates, in the manufacture of sheet-metal cans, boilers, tanks, and hardware generally.

If the transformer T is properly proportioned, the current may be just sufficient to produce the welding operation so long as the two lapped parts of the plates are not fully pressed together, and when this latter takes place by the welding the resistance will be so

low that the current loses its power to fuse, and the lapped ends will not be melted off or injured. This will insure the process being automatic and adapted to take care of itself to avoid injury to the plates.

I do not confine myself to the details of construction of the apparatus for carrying my invention into practice, as these may be modified without departing from the spirit of the invention.

What I claim as new, and desire to secure by Letters Patent, is as follows:

1. The method of welding two wide thin flat sheets of metal together to form one continuous sheet which consists of first shaping the end of one or both sheets so as to produce a large number of small projecting portions arranged in line across the sheet or sheets, then overlapping the ends of said sheets so as to bring them in contact along a series of small points in the lapped surface of the sheets, then passing a current of electricity simultaneously through all of the series of small points of contact, simultaneously pressing the two sheets together as the metal about the points of contact melts whereby a large series of small fluid portions of metal are formed and gradually increased in area and separated by gradually decreasing areas of solid or non-fluid portions until the several fluid portions just meet to form a long weld, and then arresting the current to prevent burning off of the ends of the sheets.

2. The herein-described method of electric welding of two wide and thin sheets of metal which consists in placing the two sheets in contact at a large number of small independent points arranged in the line of the weld transversely across the sheets, then passing a current of electricity simultaneously through the series of points of contact and pressing the two sheets together as the welding operation progresses, and continuing the said pressure until the several independent series of welds increase on all sides sufficiently to extend into each other to form one complete and long welded joint.

3. The method of forming a long sheet from two or more sheets of metal, consisting in producing a series of projections upon one of the sheets near its edge, lapping the two sheets so that they make electrical contact through the projections only, passing an electric current through the projections and both sheets, pressing the two sheets together as the weld advances, and finally passing the welded sheets through a pair of rolls to reduce the welded joint to the same thickness as the body of the sheets.

4. The method of forming a long sheet from two or more sheets of metal, consisting in producing a series of projections upon one of the sheets near its edge, lapping the two sheets so that they make electrical contact through the projections only, passing an electric current through the projections and both sheets, pressing the two sheets together as the weld

advances, passing the welded sheets through a pair of rolls to reduce the welded joint to the same thickness as the body of the sheets, and subsequently coating the continuous sheet with an outer covering as a protection to the metal forming the body of the sheet.

5. The method of forming a large sheet of metal from two smaller sheets, consisting in overlapping the adjacent ends of the sheets and holding them in contact at a series of points arranged in line across the sheet so that they are in contact for an area greatly less than the extent of surface required to constitute the completed weld, then passing an electric current through all of the portions of the sheets in contact, and as the welding proceeds forcing the two sheets into greater contact to reduce the electrical resistance and to cause the fluid places in the weld to spread toward each other.

6. The herein-described process of welding consisting in generating a current of electricity of uniform voltage and fixed maximum current, supplying this current to a large series of equally-distributed points of contact in multiple between two sheets to be welded of uniform sectional area and resistance throughout so as to offer a sufficient but subdivided resistance to secure the welding effect at a large number of points simultaneously, then pressing the two sheets together as the welding proceeds until the resistance becomes

so low that the current will cease to be sufficient in volume to continue the welding after a given extent of weld has been made, whereby the union of the sheets is secured and the destruction of the lapped portions guarded against.

7. The herein-described process of welding consisting in generating a current of electricity of uniform voltage and fixed maximum current, supplying this current to a large series of equally-distributed points of contact in multiple between two sheets to be welded of uniform sectional area and resistance throughout so as to offer a sufficient but subdivided resistance to secure the welding effect at a large number of points simultaneously, then pressing the two sheets together as the welding proceeds until the resistance becomes so low that the current will cease to be sufficient in volume to continue the welding after a given extent of weld has been made, and automatically interrupting the current when the maximum current required is reached, whereby the union of the sheets is secured and the destruction of the lapped portions guarded against.

In testimony of which invention I hereunto set my hand.

R. M. HUNTER.

Witnesses:

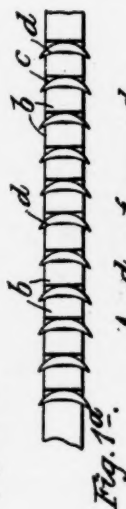
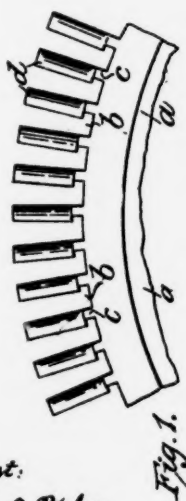
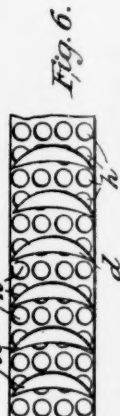
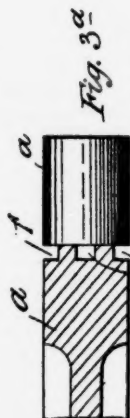
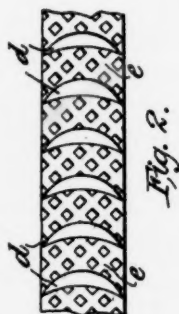
R. M. KELLY,
JOHN P. KELLY.

No. 874,398.

PATENTED DEC. 24, 1907.

S. Z. DE FERRANTI.
 BLADED TURBINE ELEMENT.
 APPLICATION FILED JULY 22, 1907.

3 SHEETS—SHEET 1.



Attest:

Wm. L. Polson

S. B. Middleton

Inventor,
 Sebastian Gioi de Ferranti
 By Spear, Middleton, & Appleton
 Attorneys

No. 874,398.

PATENTED DEC. 24, 1907.

S. Z. DE FERRANTI.
 BLADED TURBINE ELEMENT.
 APPLICATION FILED JULY 22, 1907.

3 SHEETS—SHEET 2.

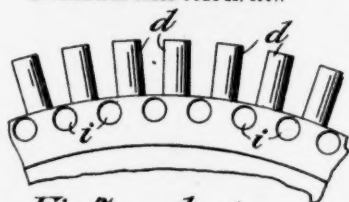


Fig. 7.

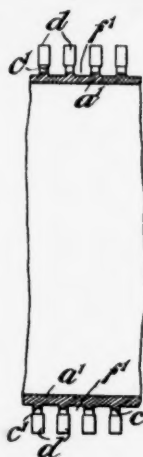


Fig. 4.

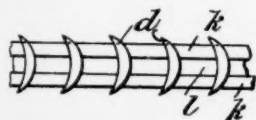


Fig. 8a



Fig. 9a

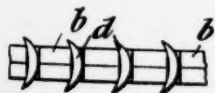


Fig. 10a

Inventor.

Sebastian Jean de Ferranti.

By *Sam. Middleton, Maitland & Co.*

Atty.

Attest:
 Geo. A. Polson,
 S. J. Middleton

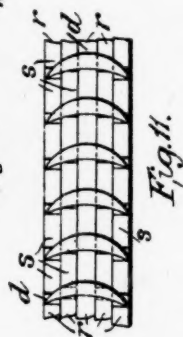
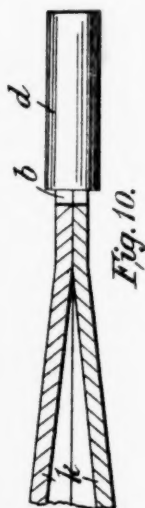
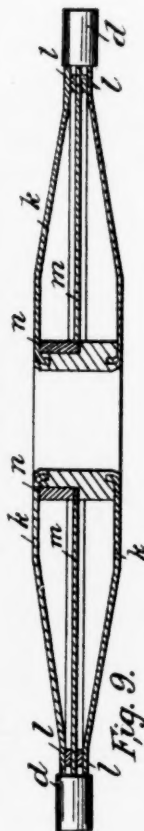
No. 874,398.

PATENTED DEC. 24, 1907.

S. Z. DE FERRANTI.
BLADED TURBINE ELEMENT.

APPLICATION FILED JULY 22, 1907.

3 SHEETS—SHEET 1



Attest:
Edw. A. Folsom
 L. P. Middleton

Inventor,
Sebastian Zani de Ferranti
 By *Spencer Middleton*
 attys.

UNITED STATES PATENT OFFICE.

SEBASTIAN ZIANI DE FERRANTI, OF GRINDLEFORD BRIDGE, SHEFFIELD, ENGLAND.

BLADED TURBINE ELEMENT.

No. 874,398.

Specification of Letters Patent.

Patented Dec. 24, 1907.

Original application filed May 14, 1904, Serial No. 208,034. Divided and this application filed July 22, 1907. Serial No. 385,066.

To all whom it may concern:

Be it known that I, SEBASTIAN ZIANI DE FERRANTI, a subject of the King of Great Britain and Ireland, residing at Grindleford Bridge, Sheffield, in the county of York, England, (late of 31 Lyndhurst road, Hampstead, London, N. W., England,) have invented a certain new and useful Bladed Turbine Element, of which the following is a specification.

The invention relates to the bladed elements of turbines and has for its object the provision of a bladed turbine element of exceedingly simple construction as regards the attachment of the blades so that calking strips, lacing or wiring and other complex means employed for fixing the blades may be dispensed with.

A turbine element with the blades welded thereon has hitherto been a desideratum since such a bladed turbine element approaches closely to the ideal form shaped from a solid mass of metal. Difficulties, however, exist in the production of such a bladed turbine element partly on account of the blades and their carrying elements differing largely as regards their power of conducting heat away from the welding point and partly on account of the close juxtaposition of the blades. Thus it is found that the comparatively large volume of metal forming the carrier rapidly conducts heat away from the welding point and prevents the temperature of the carrier rising to the required extent. I overcome all these difficulties, however, by a process described in my patent application, Serial No. 208034, which consists broadly in adjusting the volume of the metal in the neighborhood of the welding point so that approximately equal heating occurs in both faces to be welded and passing electric current through the welding point.

I believe that I am the first to produce a turbine element with the blades directly welded thereto and such a bladed turbine element forms the subject matter of the present invention.

Referring to the accompanying drawings, Figure 1 is a part side elevation of a turbine wheel having cross grooves, Fig. 1^a being an edge view; Fig. 2 shows a similar edge view of a modification in which sets of intersecting grooves are adopted; Fig. 3 shows an edge view of a form having circumferential grooves,

Fig. 3^a being a section on the line A A of Fig. 3. Fig. 4 shows, in longitudinal sectional elevation, part of a drum carrier to which the blades are welded in accordance with one form of the invention; Figs. 5 and 6 show edge views of modifications in which holes are bored radially into the edge of the disk, while Fig. 7 is a part side elevation in which holes are bored through from face to face of the disk. Fig. 8 shows a sectional plan of a form of wheel built up of two dished disks, held apart at their circumferential portions by distance pieces, Fig. 8^a being a scrap edge view to a larger scale; Fig. 9 is a similar sectional plan of a modified form of wheel built up of three disks, while Fig. 9^a is a corresponding scrap edge view also to a larger scale; Fig. 10 shows a part sectional elevation of a wheel built up of two comparatively thick disks having notched edges. Fig. 10^a being a scrap edge view, while Fig. 11 shows an edge view of a form of wheel built up of a series of "stepped" laminae.

(It will be seen that all the edge views in the preceding figures are shown as developments for clearness of drawing and not as true projections).

In carrying out the invention according to the form shown in Figs. 1 and 1^a, the turbine wheel or disk is shown at *a*, cross grooves, *b*, being cut in its circumferential edge so as to leave projecting portions of metal, *c*, to which the turbine blades, *d*, are welded. The same object is attained by cutting two intersecting sets of grooves, *e*, in the edge of the disk, as is shown in Fig. 2, or by cutting circumferential grooves, such as *f*, completely round the edge (see Figs. 3 and 3^a).

Fig. 4 shows the invention according to one form applied to the case of a drum blade carrier, *a'*; the drum is grooved circumferentially with grooves, *f'*, the intervening collars of metal being then cross-cut to form projecting teeth, *c'*, on which the blades are welded.

According to a modified form, radial holes, *h*, may be bored a short distance into the edge of the disk, these holes being either arranged in patterns so as to leave intervening projections of untouched metal to which the blades may be welded as shown in Fig. 5, or arranged without particular reference to the position of the blades, (see Fig. 6).

In Fig. 7, a method is shown of removing

metal in the neighborhood of the welding point by boring holes, *i*, through (or partly through) from face to face of the disk at a radius slightly less than that of its outside edge.

The object to be kept in mind in this as in other modifications, is to remove sufficient metal to enable the temperature to rise to the welding point as explained above, while at the same time leaving sufficient areas untouched to insure the mechanical strength in the welded joint.

Referring now to Figs. 8 and 8*, a form of wheel is shown somewhat diagrammatically which is built up of two dished disks, *k*, of comparatively thin metal, held apart at their circumferential portions by one or more distance pieces, such as *l*, disposed at a radius somewhat less than the maximum radius of the disks, the blades, *d*, being welded in position on their outside edges.

Figs. 9 and 9* show a type of wheel generally similar to that last described but having an intermediate plane disk, *m*, in addition to the two dished disks, *k*; a portion, *n*, of the hub, *o*, is in this case made detachable so as to allow the different parts of the wheel to be assembled. Distance pieces, *l*, are indicated as before but any other convenient method of holding the disks in their correct relative position may be adopted.

In Figs. 8 and 9, the dished disks, *k*, are indicated as secured to the hubs, *o*, by pressing the inner edges of these disks into grooves and subsequently burring over the hubs to hold the disks in place.

In the modification shown in Figs. 10 and 10*, two dished disks, *k*, are again employed but of thicker metal, their circumferential portions being brought into contact and cross grooves, *b*, being cut in their edges in accordance with the method described above with reference to Figs. 1 and 1*. Again, that portion of the disk carrying the blades may be built up of a set of thin laminæ, *r*, (see Fig. 11), the edges of which are notched as at *s*; the laminæ being assembled in such a way that the notches, *s*, are "stepped" with regard to each other, so that the intervening projections of metal may follow the shape of the turbine blades to be welded to them.

Instead of notching the laminæ, they may be prepared in accordance with other of the methods pointed out above, before being assembled in the manner indicated.

In this invention, it is not practicable to describe every method of carrying its broad underlying principle into effect, but the scope is sufficiently indicated by the many examples given above and moreover it will be evident without further description, how the invention may be applied to the welding together of turbine blades and carriers of other forms than those described above by way of example.

Having now described my invention what I claim as new and desire to secure by Letters Patent is:-

1. A turbine blade carrier having blades welded directly thereto.

2. A turbine blade carrier with blades attached thereto wholly by welding.

3. A turbine blade carrier having blades attached thereto by welds, certain working stresses on said blades being transmitted to said carrier through said welds.

4. A turbine blade carrier having blades attached thereto by welds, certain bending stresses due to impact of fluid on said blades being transmitted to said carrier through said welds.

5. A turbine rotor having blades attached thereto by welds, certain working stresses on said blades being transmitted to said rotor through said welds.

6. A turbine blade carrier having blades attached thereto by welds and recesses in the carrier in the neighborhood of said welds.

7. A bladed turbine element, comprising in combination a blade carrying element, the volume of the peripheral portion of which in the neighborhood of the point of attachment of the blades has been so adjusted as to retard flow of heat away from said point of attachment together with blades welded to said carrying element.

8. A bladed turbine element comprising in combination a blade carrying element from the peripheral portion of which metal has been removed in the neighborhood of the point of attachment of the blades so as to retard flow of heat away from said point of attachment together with blades welded to said carrying element.

9. A bladed turbine element comprising in combination a blade carrying element having depressed portions on its peripheral area with intervening portions raised relatively to said depressed portions and blades welded to said relatively raised portions.

10. A bladed turbine element comprising in combination a body portion, blade carrying members proper attached to said body portion by one face and having blades welded to an opposite face together with spaces intervening between said blade carrying members proper.

11. As a new article of manufacture, a bladed turbine element having a plurality of spaced blades attached to the periphery of said carrier by direct butt welds.

12. A bladed turbine element comprising in combination a blade carrying element having a circularly disposed aggregation of depressed portions alternating with relatively raised portions and blades welded to said relatively raised portions.

13. A bladed turbine element comprising in combination a body portion; a circularly disposed aggregation of blade carrying mem-

bers proper attached to said body portion by one face and having blades welded to an opposite face together with spaces intervening between said blade carrying members proper.

5 14. A bladed turbine element comprising in combination a blade carrying element having a plurality of raised portions regularly spaced along said carrying element and blades welded to said raised portions.

10 15. A bladed turbine element comprising in combination a circular blade carrying ele-

ment having a peripheral portion, a plurality of raised portions regularly spaced along said peripheral portion and blades welded to said raised portions.

In testimony whereof, I affix my signature in presence of two witnesses.

SEBASTIAN ZIANI DE FERRANTI.

Witnesses:

ALBERT E. PARKER,
HENRY H. GRUNING.

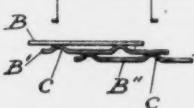
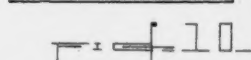
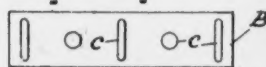
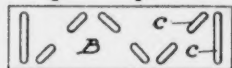
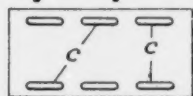
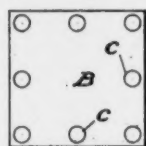
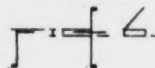
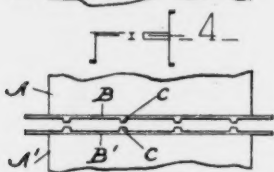
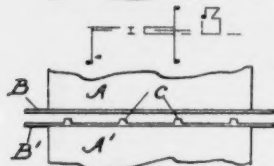
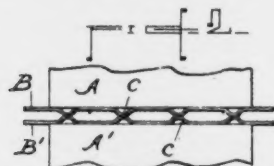
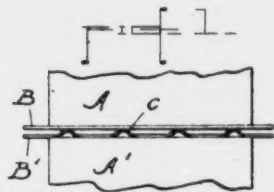
A. F. RIETZEL.

UNITING THE COMPONENT PARTS OF COMPOSITE SHEET METAL STRUCTURES.

APPLICATION FILED FEB. 24, 1906.

928,701.

Patented July 20, 1906.



WITNESSES:

Edw. Schmeider
Edward Schmeider

INVENTOR

Adolph F. Rietzel

BY

Thomson & Decker
ATTORNEYS

UNITED STATES PATENT OFFICE.

ADOLPH F. RIETZEL, OF LYNN, MASSACHUSETTS, ASSIGNOR TO THOMSON ELECTRIC WELDING COMPANY, OF LYNN, MASSACHUSETTS, A CORPORATION OF MAINE.

UNITING THE COMPONENT PARTS OF COMPOSITE SHEET-METAL STRUCTURES.

No 928,701.

Specification of Letters Patent.

Patented July 20, 1909.

Application filed February 24, 1905. Serial No. 247,061.

To all whom it may concern:

Be it known that I, ADOLPH F. RIETZEL, a citizen of the United States, and a resident of Lynn, in the county of Essex and State of Massachusetts; (with post-office address Lynn, Massachusetts,) have invented certain new and useful Improvements in Uniting the Component Parts of Composite Sheet-Metal Structures, of which the following is a specification.

My invention relates to the manner of uniting or fastening two pieces of metal to one another and its object is more particularly to afford a substitute for the manner of uniting pieces of metal as heretofore practiced in the art of electric welding.

As applied to sheet metal manufactures the object is to afford a cheap and practical substitute for riveting and other methods of mechanically securing the two pieces of metal together. As applied to this branch of the metal working arts, the invention affords a means whereby articles of composite sheet metal manufacture may be made up by fastening the pieces of metal constituting the structure with a perfectly secure union and by a process that can be economically conducted.

Briefly stated, the invention consists in electrically welding pieces together in spots definitely located in and involving a portion only of their meeting surfaces, by the application of pressure and heating current localized in such spot or spots.

By the terms "weld" and "electric weld", as herein employed, I refer to that process of welding in which the metal is brought to plastic condition by passing an electric current from one to the other of two pieces where they are in contact and is welded while in such condition by the application of pressure, as contra-distinguished from a process of uniting metals, which is described in a patent to Bernardos, No. 363,320, dated May 17, 1887, and in which the union is effected by melting the metal by an arc and which is different from "welding" in the ordinary sense of the term as applied to metal manufactures, in that the metal is heated beyond the point of plasticity and pressure is not employed.

It has been before proposed to electrically

weld two rods of metal together by a butt-welding process, the area of union effected being substantially coextensive with the cross-section of the pieces at their meeting ends, that is to say, the weld has been made over substantially the whole area of the opposed portions of said pieces. It has also been proposed to make a lap joint between the ends of two strips of metal by electrically uniting them together over substantially the whole area of the lapping surfaces. A weld formed according to my invention is distinguished however from such prior welds by the fact that the opposed surfaces are welded together in spots only, the heating electric current being localized or confined in any desired way to such spots so that the major portion of the opposed surfaces will not be involved in the welding, although they may, after the completion of the operation, lie in contact with one another or very close together.

My invention is particularly valuable in fastening of pieces of sheet metal together because not only does it limit the amount of electric energy required very considerably as compared with the prior methods of union, but it also diminishes the liability to burning of the metal which is liable to occur when the attempt is made to form a union of two sheets of metal by an electric welding process over substantially the whole area of the meeting or opposed surfaces.

In carrying out my invention any desired number of spots of union may be employed, such number depending obviously upon the extent of the meeting surfaces which are to be fastened together and also upon the strength of the union desired.

In carrying out my invention the localization of the flow of heating electric current and of welding pressure to the desired spot or spots may be brought about in any desired way. One of the preferred ways is by providing between the meeting surfaces or portions of the pieces to be united suitable conducting projections or points at the spots of union, which projections or points carrying the heating electric current from one piece to the other are so located in the meeting surfaces and are so separated from one another that on the application of the weld-

ing pressure the welded union resulting will be localized in the area of the opposed surfaces and will be substantially coextensive in area with the restricted area of the path of the effective heating current. Various ways of providing such points or projections will occur to those skilled in the art.

The preferred method is to indent the metal from the side reverse to that on which the union is effected by a suitable tool, the projections thus formed affording points for the passage of the electric current. This method is preferable also because it permits the welding to be produced at a multiplicity of spots simultaneously through the application of pressure over the whole rear surface of the plate, the points or projections in that case serving not only to localize the flow of the heating current but also to localize the welding pressure.

In the preferred manner of carrying out my invention in the case of sheet metal manufacture I provide projections from the meeting surfaces of both pieces that are to be united. Said projections may also be provided by interposing between the two plane sheets small pieces of conducting material which act in the same manner when the sheets are brought together, as projections which localize the heating current and the pressure. It will be understood, however, that in the latter instance as in the former, these pieces are so small and are placed such a distance apart that on the application of welding pressure there will be no running of the welds into one another but that the final union will be in spots only leaving well-defined areas on the meeting surfaces, in which the surfaces either lie in contact or separated from one another by a very thin space.

From the foregoing it will be seen that my invention is distinguished from prior methods of welding pieces of metal together in that it may be very cheaply practiced, because no attempt is made to weld over the whole of the opposed surfaces of the welded pieces; but on the contrary the union is at a spot or spots only which in ordinary cases will afford as strong a union as would be produced by the riveting of the pieces.

The invention further has the advantage that not nearly so much electric energy is required as is necessary when the electrically welded union extends over the whole area of the opposed surfaces. Moreover, the danger of burning when the attempt is made to weld two sheets of metal together by a lap weld is largely eliminated.

In the accompanying drawings Figures 1, 2, 3, 4 and 5 illustrate some of the ways in which the pieces of metal to be united may be prepared for the welding according to my invention. Figs. 6, 7, 8, and 9 show modifications in the form and disposition of the contact projections which result in the spots

of electrically welded union. Fig. 10 shows the assembling of three plates together for welding according to my invention.

In the various figures of the drawing the invention is illustrated as carried out with two sheets of metal B, B'. In Fig. 1, plate B' only is provided with the distinct or isolated spots (c) or projections for the flow of the electric current, to the plate B, which spots or points may be formed by indenting the plate with a suitable tool. The spots are located so far from one another that on the application of pressure coincidently with the flow of electric current from one plate to the other there will be a number of distinct areas or spots of electrically welded union of the plates separated by well-defined areas on the meeting surfaces in which no union takes place. The resultant is however a fastening of the plates together securely and which is practically as effective as if the attempt were made to form a welded union over the entire areas of the meeting surfaces. Obviously, the greater the distance between the spots the lesser the number that would be used and hence the lesser the consumption of energy in effecting the weld. This is of considerable importance where the meeting areas are large or where a considerable amount of work has to be done. The welding pressure is conveniently applied by conducting blocks or electrodes, A, A', between which the two pieces B, B', are assembled. These electrodes, A, A', furnish the heating current while applying the pressure, the localization of the pressure in the spots being brought about in this instance by the pointing of the surfaces at point c.

In Fig. 2 both plates are provided with projections the points of which engage with one another, the pointing being produced by indenting the metal sheets from the rear.

Fig. 3 illustrates the localization of the welding by casting projections upon one of the sheets and Fig. 4 by casting projections on both pieces. The localization of the welding in spots might be effected as illustrated in Fig. 5 by interposing small pieces of metal at the spot or spots of desired union, these pieces operating when the plates are brought together in the same way as the projections before referred to. The number and size of the pieces and their distance apart is in this case, as before, so chosen that the application of pressure together with the flow of heating current from one plate to the other will result in a union of the two pieces over their opposed surfaces in spots only thereon.

Fig. 6 shows how the spots might be disposed to fasten the pieces together in distinct spots around their edges.

As shown in Figs. 7 and 8 the projections, instead of being round, might be somewhat elongated and irregularly or symmetrically arranged.

Fig. 9 shows round and somewhat elongated projections combined.

In all these instances however, the union over the surfaces of the plates is confined to spots or areas which are of comparatively small extent as compared with the total area of the meeting surfaces. As will be obvious, the form and disposition of the points or projections of initial contact for flow of the electric current and localization of the pressure may be greatly varied without departing from my invention.

Fig. 10 illustrates the welding of three plates of sheets together when superposed.

My invention is especially useful in the manufacture of articles from sheet metal which are stamped out to different forms, and which have heretofore had their component portions united by riveting or other purely mechanical expedient which is not only expensive but requires generally special tools and results in many cases in an insecure union. When the invention is employed in its preferred form or manner of practice in the field of sheet metal manufacture all that is necessary is to provide the contact spots or projections as already described and then to assemble the pieces in an electric welding machine and weld them together as already set forth.

The product of the foregoing process is readily distinguishable from that produced by melting down the metal of the pieces from the back at spots as proposed in the before mentioned patent of Bernardos in that there is no substantial alteration of condition of the metal back of the welds appearing as a burning, roughening or disintegration of the material by the very great heat of the electric arc employed for melting down the metal, and by the further fact that the unions themselves in the material of the juxtaposed or opposite faces have the characteristics of a true weld produced by bringing the metal to welding temperature only and applying pressure, so that the pieces are solidly and firmly united and cannot be readily torn apart as they could be if the metal at the spots has been melted down under the high temperature of the electric arc.

The product in the form of sheet metal is further particularly useful for sheet metal ware since the outer or exposed surface of the metal will have the smooth and practically unaltered finish of sheet metal and said surface will not be substantially marred when the process is properly conducted, excepting for the presence of such infrequent small depressions as might remain from the previous indentation of the metal from the back when, as hereinbefore described, an indenting of the metal may be resorted to.

The product in sheet metal also possesses the advantage that the spots of welding when located within the edges of the meeting

surfaces will not show. The product is also superior to that produced by riveting of the plates in that there are no rivet heads to mar the finish of the back or outer surfaces of the metal.

What I claim as my invention is:

1. The hereinbefore described improved method of fastening two pieces of metal together by electrically welding them to one another at spots only of their juxtaposed or opposite faces by the application of pressure and heating current localized in such spots.

2. The herein described method of uniting two pieces of metal at a number of distinct or separate spots separated from one another by well-defined areas of no union, consisting in applying pressure localized at the spots of desired union, and passing electric current through the pieces from one to the other while confining the flow of current to said spots until the union is effected.

3. The herein described method of uniting two pieces of metal, consisting in pressing them together while passing a heating electric current from one to the other and localizing the flow of current and the heating throughout the operation in a spot or spots of circumscribed or limited area as compared with the area of the immediately opposed surfaces so as to limit the union of the pieces to a spot or spots.

4. The improved method of uniting two pieces of metal at a spot or spots only in their opposed meeting surfaces, consisting in pressing the two pieces together, and passing a welding electric current from one to the other while localizing the pressure in and confining the flow of current to the spot or spots of desired union, so as to produce an isolated spot or spots of union, leaving distinct or well-defined areas in which the pieces are not welded together.

5. The method of uniting two sheet metal pieces together face to face, consisting in pressing them together, and, simultaneously with the pressure, passing an electric current from one to the other at isolated or distinct spots in the areas lapping or opposed, said spots being separated from one another by such a distance that there is a union of the sheets at spots entirely surrounded by areas of no union.

6. The method of uniting sheets of metal by pressing them together and at the same time passing a heating and welding current from one to the other at a spot on their meeting surfaces which is restricted in area throughout the operation so as to leave on the meeting surfaces a well-defined and comparatively extensive area of no union completely surrounding said spot.

7. The method of welding two pieces of metal together, consisting in superposing said pieces with their surfaces at which the union is to take place superposed or pre-

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8 sented to one another, pressing the pieces together, and passing a heating electric current from one to the other while localizing the heating current simultaneously in a number of distinct or separate spots of limited area, separated from one another sufficiently to secure a union of the pieces in a number of corresponding distinct spots surrounded by and separated from one another by distinct areas in which no union exists.

10 8. The method of uniting two pieces of metal, consisting in providing between their meeting surfaces a number of projections, spaced apart as described, pressing the pieces together and passing an electric current through said projections while confining the welding area of such current to said projections so as to leave distinct areas around spots in which no welding shall be produced.

20 9. The method of fastening two plates of metal together at a multiplicity of distinct or separate points of welded union, consisting in providing between them a number of isolated contact spots adapted to pass an electric current from one to the other but so separated that the electric welds will be separated from one another by unwelded areas, passing a heating electric current through such spots simultaneously and applying pressure as and for the purpose described.

10. The herein described method of electrically welding two plates or sheets of metal of any gage together by distinct spots of union disposed over their plane surfaces, consisting in providing a multiplicity of electrical contact spots coincident with the separated spots of union and disposed at such distances apart that there will be well-defined areas between spots through which the electric current will not flow, passing electric current from one plate to the other through said contact spots simultaneously and applying pressure as and for the purpose described.

11. The method of fastening two sheets of metal together, consisting in providing between them a number of isolated contact spots for the passage of the electric welding current, said spots being adapted to initially hold the plates apart and being separated from one another a sufficient distance to confine the welding to distinct areas or isolated spots, passing a heating electric current through a number of said contact spots simultaneously and pressing the plates together as and for the purpose described.

12. The method of fastening two plates of metal together, consisting in furnishing a surface of said plates with a number of projecting contact spots for the passage of welding electric current and disposed at such distances apart that on the application of pressure the welds will not run into one another,

superposing said plates, passing a heating electric current from one to the other over said separated spots and applying the pressure to produce a spot-welding of the plates to one another as and for the purpose described.

13. The herein described method of fastening two pieces of metal together by providing each plate with a number of projecting contact spots on its plane surface disposed at such distances apart that the unions will not run into one another but will, nevertheless, firmly hold the plates together, superposing said plates with the projecting spots in simultaneous engagement with one another, passing a heating electric current from one plate to the other through the spots and simultaneously applying pressure thus uniting the plates at a number of distinct points of welded union.

14. The method of uniting two sheets of metal face to face, consisting in indenting the material, superposing the plates with the points of the indentations engaged, passing an electric current from one plate to the other through said points simultaneously, and applying pressure while confining the area of heating to welding temperature to a circumscribed area or spot entirely surrounded by areas unheated to welding temperature to unite the pieces in a distinct spot or spots of small extent in the whole area of the opposed faces.

15. The herein described method of fastening two plates together at a multiplicity of distinct mechanically separated points of welded union, consisting in indenting each plate to form a number of projecting contact spots on the planesurfaces which are to abut, superposing said plates with the projecting spots in simultaneous engagement with one another, passing a heating electric current from one plate to the other thereby forming a number of distinct zones or points of heated metal, heated to welding temperature, and applying pressure to complete the union of plates by a number of mechanically distinct unions.

16. Metal plates fastened together by a number of distinct or isolated welds on their meeting surfaces and in spots comprising meeting portions of the metal plates, the backs of said plates being practically unaltered in their metallic condition and the spots on the meeting surfaces being separated from one another by distinct unwelded areas.

17. Sheet metal work comprising pieces of sheet metal welded together in the material of their meeting surfaces and in spots only, each surrounded by distinct areas of unwelded union, the back surfaces of said pieces being substantially unaltered over the welded spots, substantially as and for the purpose described.

18. Composite metal work having its component pieces welded together in spots only involving the material of their opposed or meeting surfaces, said spots being each entirely surrounded by distinct areas of unwelded union and the portion of the pieces back of the welds being substantially unaltered, as and for the purpose described.

19. Metal work comprising a metal plate fastened on its surface to the opposed surface of another piece of metal by a weld at a spot only in the material of the opposed surfaces, said spot being surrounded by a distinct area of unwelded union and the back surface of said plate being practically unaltered

over said spot, as and for the purpose described.

20. A metal article comprising two bodies of metal having adjacent plane surfaces united at a plurality of spaced and isolated spots of integral and autogenous welded union, the metal at the spots of welded union having substantially the same qualities as at other points.

Signed at Lynn in the county of Essex and State of Mass. this 7th day of Feb. A. D. 1905.

ADOLPH F. RIETZEL.

Witnesses:

EDWIN W. HAWES.

E. I. FOSTER.

DISCLAIMER.

928,701.—Adolph F. Rietzel, Lynn, Mass. UNITING THE COMPONENT PARTS OF COMPOSITE SHEET-METAL STRUCTURES. Patent dated July 20, 1909. Disclaimer filed June 12, 1915, by the assignee, Thomson Electric Welding Company.

Enters this disclaimer to that part of the invention described in said patent which is set forth in the specification in the following words:

"Briefly stated, the invention consists in electrically welding pieces together in spots definitely located in and involving a portion only of their meeting surfaces by the application of pressure and heating current localized in such spot or spots... except when that process is carried out by the preferred method of providing conducting projections or points between the meeting surfaces of the pieces to be united; and also enters its disclaimer to that part of the claim in the specification which is in the following words:

"1. The hereinbefore described improved method of fastening two pieces of metal together by electrically welding them to one another at spots only of their juxtaposed or opposite faces by the application of pressure and heating current localized in such spots.

"2. The herein described method of uniting two pieces of metal at a number of distinct or separate spots separated from one another by well-defined areas of no union, consisting in applying pressure localized at the spots of desired union, and passing electric current through the pieces from one to the other while confining the flow of current to said spots until the union is effected.

"3. The herein described method of uniting two pieces of metal, consisting in pressing them together while passing a heating electric current from one to the other and localizing the flow of current and the heating throughout the operation in a spot or spots of circumscribed or limited area as compared with the area of the immediately opposed surfaces so as to limit the union of the pieces to a spot or spots.

"4. The improved method of uniting two pieces of metal at a spot or spots only in their opposed meeting surfaces, consisting in pressing the two pieces together, and passing a welding electric current from one to the other while localizing the pressure in and confining the flow of current to the spot or spots of desired union so as to produce an isolated spot or spots of union, leaving distinct or well-defined areas in which the pieces are not welded together.

"5. The method of uniting two sheet metal pieces together face to face, consisting in pressing them together, and, simultaneously with the pressure, passing an electric current from one to the other at isolated or distinct spots in the areas lapping or opposed, said spots being separated from one another by such a distance that there is a union of the sheets at spots entirely surrounded by areas of no union.

"6. The method of uniting sheets of metal by pressing them together and at the same time passing a heating and welding current from one to the other at a spot on their meeting surfaces which is restricted in area throughout the operation so as to leave on the meeting surfaces a well-defined and comparatively extensive area of no union completely surrounding said spot.

"16. Metal plates fastened together by a number of distinct or isolated welds on their meeting surfaces and in spots comprising meeting portions of the metal plates, the backs of said plates being practically unaltered in their metallic condition and the spots on the meeting surfaces being separated from one another by distinct unwelded areas.

"17. Sheet metal work comprising pieces of sheet metal welded together in the material of their meeting surfaces and in spots only, each surrounded by distinct areas of unwelded union, the back surfaces of said pieces being substantially unaltered over the welded spots, substantially as and for the purpose described.

"18. Composite metal work having its component pieces welded together in spots only involving the material of their opposed or meeting surfaces, said spots being each entirely surrounded by distinct areas of unwelded union and the portions of the pieces back of the welds being substantially unaltered, as and for the purpose described.

"19. Metal work comprising a metal plate fastened on its surface to the opposed surface of another piece of metal by a weld at a spot only in the material of the opposed surfaces, said spot being surrounded by a distinct area of unwelded union and the back surface of said plate being practically unaltered over said spot, as and for the purpose described.

"20. A metal article comprising two bodies of metal having adjacent plane surfaces united at a plurality of spaced and isolated spots of integral and autogenous welded union, the metal at the spots of welded union having substantially the same qualities as at other points."—(Official Gazette, June 22, 1915.)

S. Z. DE FERRANTI.

PROCESS FOR ELECTRICALLY WELDING TURBINE BLADES.

APPLICATION FILED MAY 14, 1904.

Patented July 27, 1915.

3 SHEETS—SHEET 1.

1,148,221.



Fig. 2



Fig. 3a

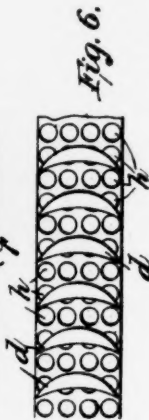


Fig. 6.



Fig. 1.



Fig. 1a.



Fig. 3.

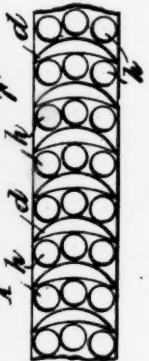


Fig. 5.

ATTEST
 Notarially
 Edward Barton

INVENTOR
 SEBASTIAN Z. DE FERRANTI

By *Heur, Middleton, Donaldson & Spear* ATTORNEYS

S. Z. DE FERRANTI.
PROCESS FOR ELECTRICALLY WELDING TURBINE BLADES.
APPLICATION FILED MAY 14, 1904.

1,148,221.

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3 SHEETS—SHEET 2.



Fig. 8.

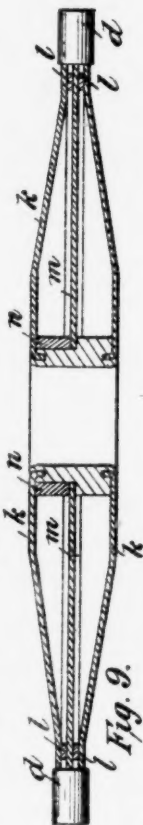


Fig. 9.



Fig. 10.



Fig. 11.

ATTEST:
CORNWALLISTON
Edward Linton

INVENTOR
SEBASTIAN Z. DE FERRANTI.
BY Spear, Middleton, Donaldson & Spear
ATTY.

S. Z. DE FERRANTI.

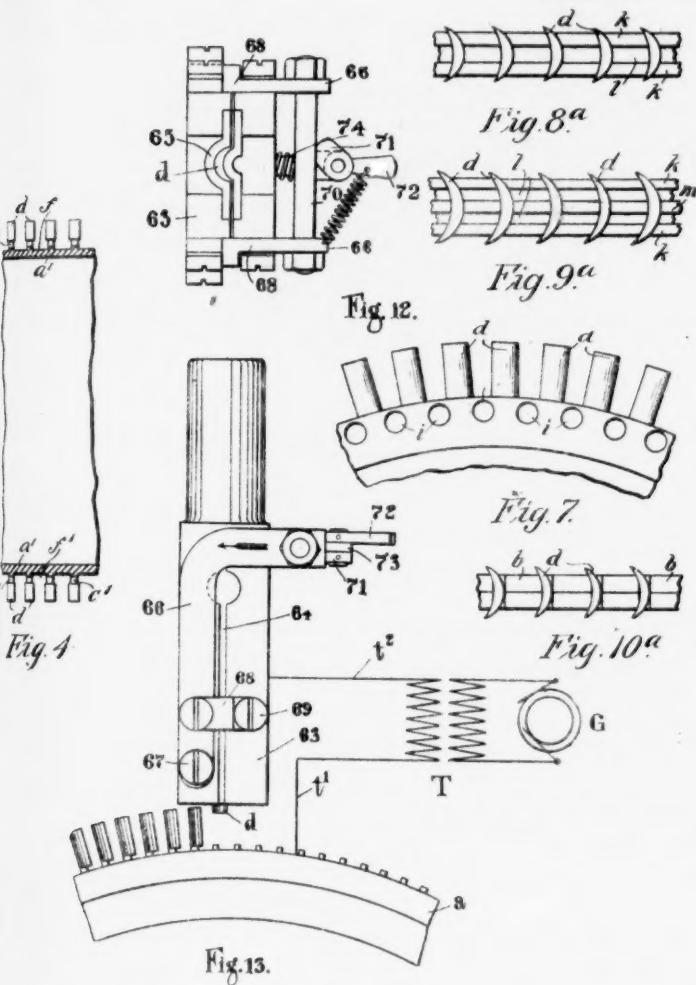
PROCESS FOR ELECTRICALLY WELDING TURBINE BLADES.

APPLICATION FILED MAY 14, 1904.

Patented July 27, 1915.

3 SHEETS—SHEET 3.

,148,221.



WITNESSES

Wm. Barrett
J. H. Alden

Sebastian J. de Ferranti
BY
Speer, Muddala, Donatelli & Speer
ATTORNEYS

INVENTOR

BY

UNITED STATES PATENT OFFICE.

SEBASTIAN ZIANI DE FERRANTI, OF HAMPSTEAD, LONDON, ENGLAND.

PROCESS FOR ELECTRICALLY WELDING TURBINE-BLADES.

1,148,221.

Specification of Letters Patent.

Patented July 27, 1915.

Application filed May 14, 1904. Serial No. 208,034.

To all whom it may concern:

Be it known that I, SEBASTIAN ZIANI DE FERRANTI, a subject of the King of Great Britain and Ireland, and residing at 31 Lyndhurst road, Hampstead, London, N. W., England, have invented a certain new and useful Process for Electrically Welding Turbine-Blades, of which the following is a specification.

The invention relates to the electrical welding of turbine blades on to the wheels, rings or drums carrying them and has for its object to overcome the difficulties which have been experienced in electrically welding together two such parts differing considerably as regards their power of rising to the required welding temperature when heated at the point of junction, so that blade carrying elements with welded blades may be reliably produced in an inexpensive manner.

The main difficulty arises through the blades and their carriers differing as regards their power of conducting heat away from the welding point.

In the welding of a turbine blade to the carrier to which it is to be secured, it is found that the comparatively large volume of metal forming the carrier, rapidly conducts heat away from the welding point thus preventing the temperature of the carrier rising to the required extent and causing an unsatisfactory weld.

The invention, therefore, consists broadly in adjusting the volume of the blade carrying element in the neighborhood of the welding point so that approximately equal heating occurs in both faces to be welded.

Referring to the accompanying drawings which, with the exception of Figure 4, show the invention applied, by way of example, to a type of parallel flow turbine in which the blades are mounted on the edge of a wheel like body, Fig. 1 is a part side elevation of such a wheel having cross grooves, Fig. 1^a being an edge view; Fig. 2 shows a similar edge view of a modification in which sets of intersecting grooves are adopted; Fig. 3 shows an edge view of a form having circumferential grooves, Fig. 3^a being a section on the line A A of Fig. 3; Fig. 4 shows, in longitudinal sectional elevation, part of a drum carrier to which the blades are welded in accordance with one form of the invention; Figs. 5 and 6 show edge views of modifications in which holes are bored radi-

ally into the edge of the disk, while Fig. 7 is a part side elevation in which holes are bored through from face to face of the disk; Fig. 8 shows a sectional plan of a form of wheel built up of two dished disks, held apart at their circumferential portions by distance pieces, Fig. 8^a being a partial edge view to a larger scale; Fig. 9 is a similar sectional plan of a modified form of wheel built up of three disks, while Fig. 9^a is a corresponding partial edge view also to a larger scale; Fig. 10 shows a part sectional elevation of a wheel built up of two comparatively thick disks having notched edges, Fig. 10^a being a partial edge view, while Fig. 11 shows an edge view of a form of wheel built up of a series of "stepped" laminae and Figs. 12 and 13 show a form of clamp and a diagram of the electrical connections.

(It will be seen that all the edge views in the preceding figures are shown as developments for clearness of drawing and not as true projections.)

The same reference symbols are, when possible, used in the accompanying drawings to denote similar parts.

In carrying out the invention according to the form shown in Figs. 1 and 1^a, the turbine wheel or disk is shown at *a*, cross grooves, *b*, being cut in its circumferential edge so as to leave projecting portions of metal, *c*, to which the turbine blades, *d*, are welded. The same object is attained by cutting two intersecting sets of grooves, *e*, in the edge of the disk, as is shown in Fig. 2, or by cutting circumferential grooves, such as *f*, completely around the edge (see Figs. 3 and 3^a.)

Fig. 4 shows the invention according to one form applied to the case of a drum blade carrier, *a'*; the drum is grooved circumferentially with grooves, *f*, the intervening collars of metal being then cross-cut to form projecting teeth, *c'*, on which the blades are welded.

According to a modified form, radial holes, *h*, may be bored a short distance into the edge of the disk, these holes being either arranged in patterns so as to leave intervening projections of untouched metal to which the blades may be welded as shown in Fig. 5, or arranged without particular reference to the position of the blades, (see Fig. 6).

In Fig. 7, a method is shown of removing

metal in the neighborhood of the welding point by boring holes, *i*, through (or partly through) from face to face of the disk at a radius slightly less than that of its outside edge. The object to be kept in mind in this as in other modifications, is to remove sufficient metal to enable the temperature to rise to the welding point as explained above, while at the same time leaving sufficient areas untouched to insure the mechanical strength in the welded joint.

Referring now to Figs. 8 and 8^a, a form of wheel is shown somewhat diagrammatically which is built up of two dished disks, *k*, of comparatively thin metal, held apart at their circumferential portions by one or more distance pieces such as *l*, disposed at a radius somewhat less than the maximum radius of the disks, the blades, *d*, being welded in position on their outside edges.

Figs. 9 and 9^a show a type of wheel generally similar to that last described but having an intermediate plane disk, *m*, in addition to the two dished disks, *k*; a portion, *n*, of the hub, *o*, is in this case made detachable so as to allow the different parts of the wheel to be assembled. Distance pieces, *l*, are indicated as before but any other convenient method of holding the disks in their correct relative position may be adopted.

In every case it will be seen that those portions of the carrier to which the blades are to be welded are partially isolated from the body of the carrier by slots, holes and so forth so as to limit the cross-sectional area available for the conduction of heat, and so compel the carrier to rise to the welding temperature. On the other hand to prevent the blades being burnt away, their mass is artificially increased by holding them between clamps or jaws of high heat conductive material such as copper. Thus referring to Figs. 12 and 13, the jaw holder 63, is separated into two branches by means of the slot, 64, each branch carrying a copper jaw, 65, shaped so as to clear adjacent blades. Between the jaws, 65, the blade to be welded is clamped, so as to leave the tip only exposed as seen in Fig. 13, and in order to insure a good contact and rigid holding of the blade in the jaws, a clamping device is preferably arranged in addition to that provided by the spring of the two branches of the jaw holder.

According to the form shown links, 66, are pivoted at 67, to one branch of the jaw holder, while short cross links, 68, connect the links, 66, to the other branch to which they are pivoted at 69. The long links, 66, are curved as shown, and are connected at their non-pivoted ends by the cross-piece, 70, to which pressure to clamp the blade is applied in the direction of the arrow (see Fig. 13) by means of the cam, 71, and the hand lever, 72, both of which are secured

to a common axle rotatably mounted on any convenient support, 73. A spring such as 74, serves to return the links when the blade is released.

The necessary electrical connections to affect the welding are shown diagrammatically in Fig. 13, in which *G* represents an appropriate source of alternating current, and *T*, a transformer. It will be seen that while the lead, *t'*, may be connected directly to the carrier *a*, as in the example shown, it is necessary on the other hand that current to the blade, *d*, should be conveyed indirectly by way of the jaw holder, 63, and lead, *t*.

In Figs. 8 and 9, the dished disks, *k*, are indicated as secured to the hubs, *o*, by pressing the inner edges of these disks into grooves and subsequently burring over the hubs to hold the disks in place.

In the modification shown in Figs. 10 and 10^a, two dished disks, *k*, are again employed but of thicker metal, their circumferential portions being brought into contact and cross grooves, *b*, being cut in their edges in accordance with the method described above with reference to Figs. 1 and 1^a. Again, that portion of the disk carrying the blades may be built up of a set of thin laminæ, *r* (see Fig. 11) the edges of which are notched as at *s*, the laminæ being assembled in such a way that the notches, *s*, are "stepped" with regard to each other, so that the intervening projections of metal may follow the shape of the turbine blades to be welded to them.

Instead of notching the laminæ, they may be prepared in accordance with other of the methods pointed out above, before being assembled in the manner indicated.

In an invention such as the present, it is not practicable to describe every method of carrying its broad underlying principle into effect, but the scope is sufficiently indicated by the many examples given above and moreover it will be evident without further description, how the invention may be applied to the welding together of turbine blades and carriers of other forms than those described above by way of example.

The electric heating current is passed directly through the carrier and by way of clamps through the blades.

By means of my invention it will be seen that the blades are attached to their carrying elements in an expeditious and efficient manner while in the case of rotors a still further advantage is obtained over the methods of blading commonly employed inasmuch as if properly carried out the attachment of the blades by electric welding introduces no change of symmetry with respect to the axis of rotation and consequently dispenses with the tedious operation of balancing otherwise rendered necessary.

Having now described my invention what I claim as new and desire to secure by Letters Patent is:—

1. The method of attaching turbine blades to their carrier of relatively great mass which consists in adjusting the heat capacity of the localized area of the carrier at the point of attachment by partially isolating these areas from the remainder of the carrier so that a welding temperature may be reached notwithstanding the cooling effect of the mass of the carrier, and passing a uniform electric heating current directly through the carrier and by way of the clamps through the blades to weld the blades in succession to the carrier, substantially as described.

2. The method of attaching turbine blades to their rotor carrying elements one by one, consisting in equalizing the heat capacity of the welding parts by limiting the conducting areas of the carrier at the points of blade attachment symmetrically in relation to the axis of rotation of the rotor, and inclosing the blades between clamps so that on heating locally by a uniform electric current, the blades and carrier rise to approximately the same temperature on welding the blades to the carrier so prepared, substantially as described.

3. Process for the attachment of turbine blades to their carriers consisting in partially isolating those portions of the carrier in the neighborhood of the points of attach-

ment of the blades, to limit the cross-sectional area available for the conduction of heat therefrom; artificially increasing the volume of the blades by contacting them with metal masses of high heat conductive capacity and finally welding together the carriers and blades so prepared.

4. Process for the attachment of turbine blades to their carriers, consisting in forming circumferential grooves with intervening rings of metal around the carrier thereby limiting the cross sectional area available for the conduction of heat from the point of attachment so that on heating locally, said blade and said carrier rise to approximately the same temperature and welding each blade to a plurality of said rings, as set forth.

5. The method herein described of constructing a turbine wheel, ring or drum, the same consisting first in forming said wheel symmetrically in relation to its center of rotation with the parts next to the welding points reduced to properly conform to the volume of the blades and electrically welding said blades at the said points whereby the symmetry of the wheel is maintained.

In witness whereof I have hereunto set my hand in presence of two witnesses.

SEBASTIAN ZIANI DE FERRANTI.

Witnesses:

FRANCIS JAMES BIGNELL,
WALTER J. SKURTEN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

1111

Defendant's Exhibit No. 20.

No. 20

2-200.

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

THIS IS TO CERTIFY that the annexed is a true copy from the
Records of this Office of the Complete Specification and Drawings,
in the matter of the

British Letters Patent to

Charles Frederick Parkinson and Walter Gatwood,

Dated July 28, 1894,

Number 14,536,

for

Improvements in Apparatus for Heating and Welding by
Electricity.

IN TESTIMONY WHEREOF I have hereunto set my hand
and caused the seal of the Patent Office to be affixed
at the City of Washington, this 24th day
of March in the year of our Lord one
thousand nine hundred and nineteen, and of
the Independence of the United States of America the
one hundred and forty-third.

J. M. Cley
Acting Commissioner of Patents.

Parkinson and Gatwood's Improv. in Apparatus for Heating and Welding by Electricity.

In working, the secondary current induced in the core of the transformer is carried through the core to the base and then by the upright pillars or supports to the top plate and returned to the core when the circuit is completed through the part of the wheel or other article to be welded to the bottom plate which is electrically connected to the end of the core.

The V pieces which form the gluts are cut to the desired size and placed in position at the junction of the spokes while cold and the two (spokes and glut piece) are heated together to a welding heat and then compressed by the hydraulic rams.

Dated this 25th day of July 1894.

WM. P. THOMPSON & Co.,
6, Bank Street, Manchester, Patent Agents.

COMPLETE SPECIFICATION.

Improvements in Apparatus for Heating and Welding by Electricity.

WE, CHARLES FREDERICK PARKINSON, of Wellington Terrace, Morecambe, in the County of Lancaster, Electrical Engineer, and WALTER GATWOOD, of Derwent Road, Lancaster, in the said County, Mechanical Engineer, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention is designed to provide an apparatus for welding metals by means of electric currents passed through the articles to raise them to welding heat.

It is primarily designed and arranged for glutting wheel spokes and bolting railway wagon and carriage wheel centres but the several parts may be arranged to suit other descriptions of work or to act upon articles of different shape.

The invention consists essentially in constructing the apparatus with one or more alternating or continuous current transformers or generators working in conjunction with a number of hydraulic cylinders and rams the transformers or generators being connected with the bed plate or support upon which the articles are placed so that the current passes through that part of the article or at the point which is required to be treated and maintains it at the desired temperature whilst the hydraulic rams compress it and effect the welding.

The invention will be fully described with reference to the accompanying drawings in which as an example a machine is shown for heating and welding railway carriage wheels.

Fig. 1. Elevation.

Fig. 2. Sectional elevation through two opposite cylinders, with rams removed showing section through transformer.

Fig. 3. Plan

Fig. 4. Longitudinal section of single cylinder.

Fig. 5. End elevation of same.

Fig. 6. Plan of parts of same.

In the apparatus illustrated for glutting wheels the number of hydraulic cylinders A and rams B and B' employed correspond with the number of spokes of the wheel C to be operated upon and these are arranged on a circular bed D radiating from a common centre.

At or near the centre of the apparatus in front of the hydraulic cylinder is placed an electrical transformer E preferably arranged for alternating currents. The secondary coil F of the transformer terminates with two star shaped poles G and H which also act as slides upon which sliding contact pieces or carriages I and J are capable of being moved to and fro. The top pole or star shaped piece of copper G carries the sliding pieces or carriages I and the bottom pole H the

Parkinson and Gutwood's Impts. in Apparatus for Heating and Welding by Electricity.

upright sliding contact pieces J. The pieces J are preferably made in the form of or as part of a choking coil which when in use acts as a regulator to choke back the current and reduce the heating effect. A central pin K is provided to hold and support the wheel C whilst being heated and welded. It is fixed to but insulated from the secondary coil F of the transformer.

The contact pieces or carriages I connected to the top pole G carry the contact arms L which fit against the spokes of the wheel at the point to be heated. To the contact arms L may be fitted adjustable clamps L¹ to fit the radius of a larger wheel C¹ (a portion of which is shown in plan).

10 The upper end of the upright contact piece or carriage J connected to the lower pole H forms the slide for the contact block M which is caused to move to and fro therein by the forward or backward movement of the hydraulic ram B. Over and under the contact block M are placed die pieces b b¹ which are moved to and fro by the hollow hydraulic ram B¹.

15 The hydraulic cylinders A are arranged with a cast iron base or slide A¹ to which they are bolted. The slide or base A¹ is mounted on a circular bed plate D upon which they can be adjusted to any suitable position the number and position of the cylinders being regulated according to the number of spokes to be welded. The position of the cylinders can be adjusted circumferentially on the bed plate D and radially upon the slide or base A¹. The hand wheel S and screw s are arranged to move the cylinders to give the required adjustment on a radial line the screw being supported on a bracket a at the back of the base A¹.

Each cylinder A contains two rams, a solid one B and a hollow one B¹ the one sliding or working inside the other. Instead of two rams one working inside the other each cylinder may be constructed with two chambers separated by a division plate or diaphragm in which the ram works.

To the end of the ram B is fitted the sliding contact block M which moves to and fro in the slide formed by the upper end of the contact piece or carriage J and to the end of the hollow ram B¹ are fitted the die pieces b b¹ which move to and fro with it through recesses cut in the upper and lower sides of the contact block M.

Each sliding contact piece or carriage I is connected to the ram B of the corresponding hydraulic cylinder A by the connecting rod N and lever n which are pivoted together and to the fixed bracket N¹ the bracket N¹ being affixed to 35 though insulated from the upright contact piece J.

The outward movement of the ram B carries forward the contact block M which makes contact with the glut piece C¹¹ and holds it firmly against the outer rim of the wheel C at the same time bringing the contact arms L against the inner face of the wheel thereby completing the secondary circuit through 40 the part of the wheel C and glut piece C¹¹ to be heated. W W¹ are the primary leads.

Each of the upright contact pieces J is coupled to the corresponding cylinder by a connecting link R coupled to an eye bolt r in the face of the cylinder so that as the cylinder is moved back or forward to adjust its position to the size of wheel (or other work) the contact piece J is moved to or fro at the same time and by reason of the connecting rod N and lever n of the contact piece I being pivoted on the bracket N¹ its position is at the same time adjusted.

The water is admitted to the hydraulic cylinders A from the pipes T T¹ T¹¹. The pipe T admits to the back of the cylinder to move forward the ram B the 50 pipe T¹ admits to the centre of the cylinder to propel forward the hollow ram B¹ and the pipe T¹¹ admits to the front end of the cylinder to move both rams back again. Suitable valves are applied to these pipes and to the cylinder for controlling the flow of the water to the cylinder and the exhaust from it. The pipes T T¹ T¹¹ each terminate in castings V V¹ V¹¹ into which the small pipes t t¹ t¹¹ 55 slide being suitably packed so that when the position of the cylinders is altered they are free to slide with them. The upright part of the pipes T T¹ T¹¹ may be of any suitable flexible piping to allow for the lateral movement of the cylinders.

Parkinson and Gutwood's Inpts. in Apparatus for Heating and Welding by E.I. Electricity.

The secondary coil may be fitted with flexible pipe to allow of water circulating about it to keep the contacts cool.

Although one special form of machine is described and illustrated applicable for glutting railway carriage and wagon wheels it is to be understood that the construction of the apparatus may be varied to suit different forms of work.

In the construction of the machine several transformers may be employed placed diametrically opposite each other the secondary circuits of which are directly connected to the work in hand thus separate transformers can be applied to the different parts to be heated. When using more than one transformer we prefer to place in series with the primary current a choking coil or regulator.

The transformer or transformers are fixed beneath the wheel (or other work) with the secondary coil or coils terminating at the contacts I and J through the star shaped poles G and H. The wheel C (a portion of which is shown in Fig. 4) is placed upon the central supporting pin K.

The glut pieces C¹¹ (which are forged to the width of the wheel to be welded) are then placed between the die pieces b b¹ as shown in Fig. 4 water is then admitted through the pipes T t to the back of the cylinders A and the rams B forced outwards by which movement the glut pieces C¹¹ are carried forward by the contact blocks M and held against the spokes of the wheel at the same time the contact arms L (as shown in Figs. 2 and 3) are drawn against the inner face of wheel C thereby completing the secondary circuit through the metal.

The primary circuit of transformer is then closed and when the metal has been sufficiently heated the admission valve on pipe T¹ t¹ is opened and water admitted into the centre of cylinder between the two rams this forces out the hollow ram B¹ which has fixed upon its end the two die pieces b b¹ (which slide through recesses in the contact block M) until they project over the glut piece and part of spokes heated forming a closed die around the weld the admission valve on pipe T¹ is then closed allowing the full pressure (available) on the contact block M fixed on the end of ram B thereby completing the weld.

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed we declare that what we claim is :—

1. An apparatus for heating and welding metals constructed with one or more electro transformers or generators the poles of which terminate in castings of star or other shape forming slides upon which carriages fitted with contacts move to and fro upon which the articles are placed so that the current passes through the article at the point desired to be heated in combination with a number of hydraulic cylinders and rams capable of being adjusted to the requisite position and of applying the desired amount of pressure to weld the metal whilst maintained at the desired temperature substantially as described.

2. In apparatus for heating and welding metals the combination with one or more transformers constructed with terminals in the form of slides in contact with the poles of the secondary circuit and a number of hydraulic cylinders and rams by which the contact pieces are brought into contact with the work and by which the necessary pressure is applied to make a weld substantially as described.

3. Apparatus for heating and welding metals constructed with the several parts arranged in combination substantially as described and shown.

Dated this 26th day of April 1895.

WM. P. THOMPSON & Co.,
Manchester, Liverpool, and London, Patent Agents.

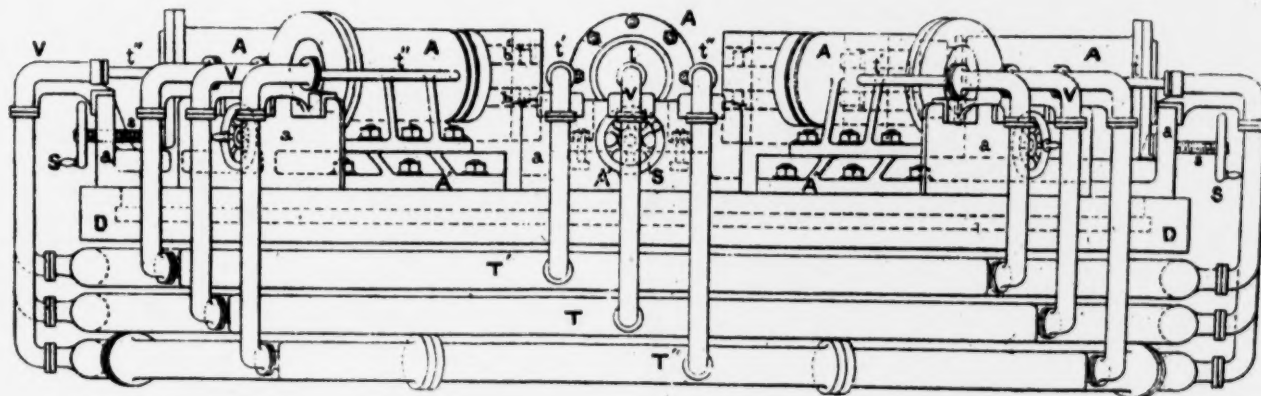


FIG. 1.

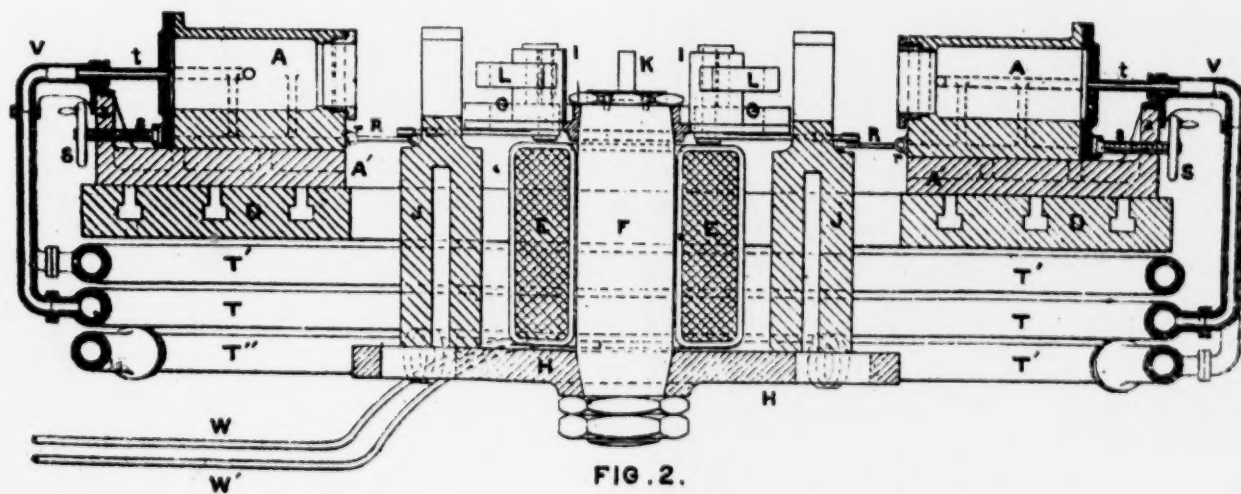
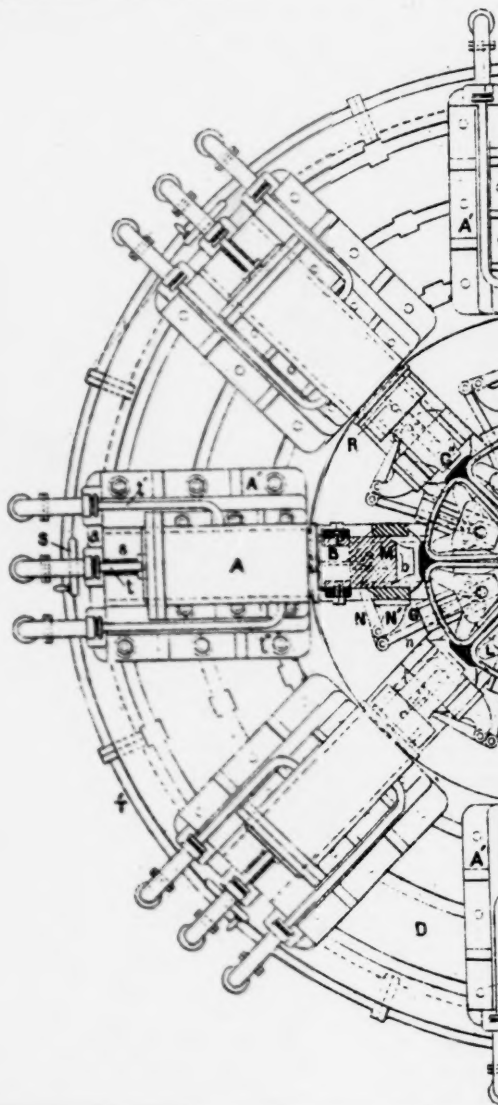


FIG. 2.

A.D. 1894. JULY 28. N^o 14,538.
PARKINSON & another's COMPLETE SPECIFICATION.



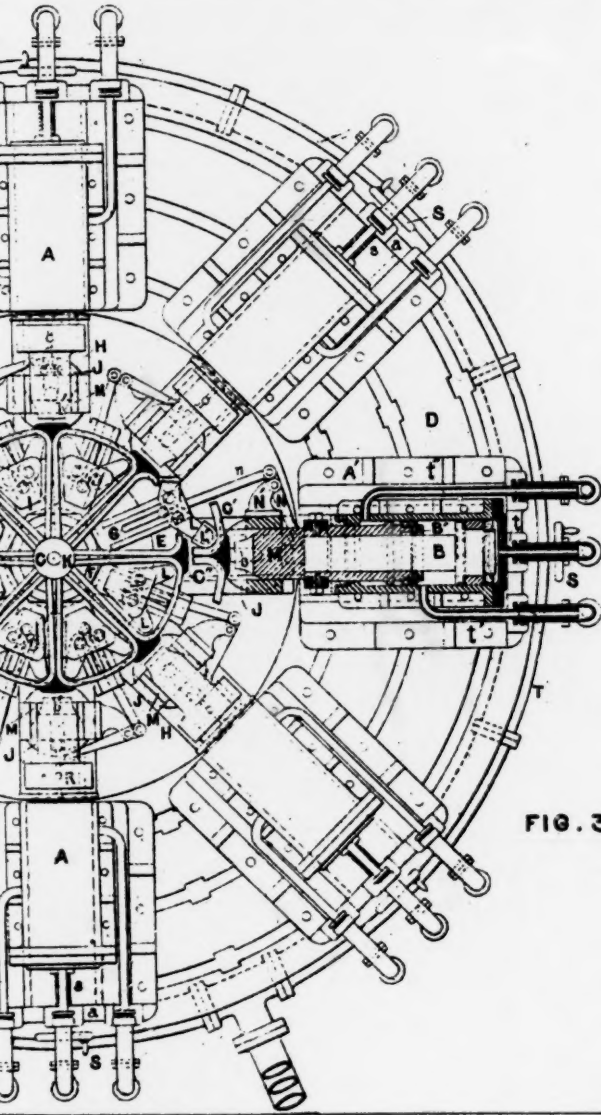


FIG. 3

A.D. 1894. JULY 28. N: 14,536.

PARKINSON & another's COMPLETE SPECIFICATION.

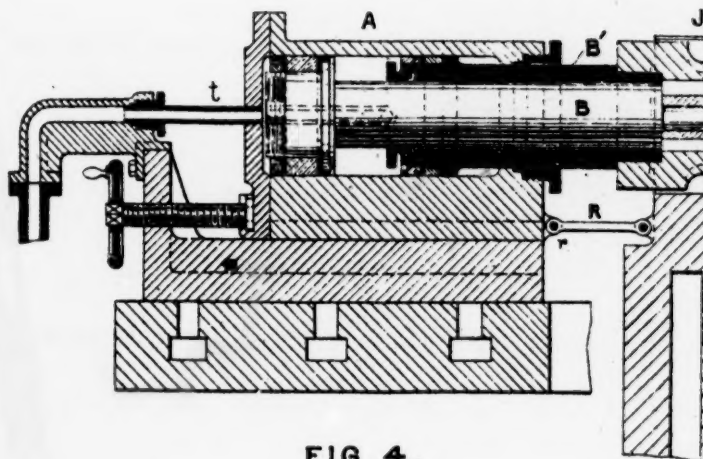


FIG. 4.

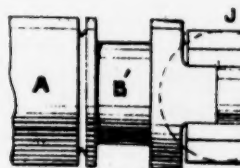


FIG. 6.

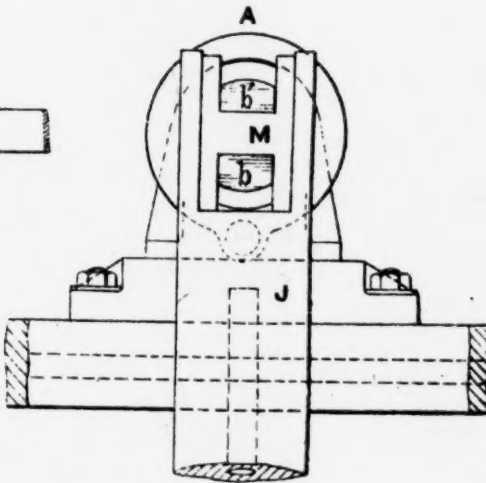
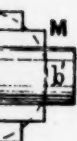
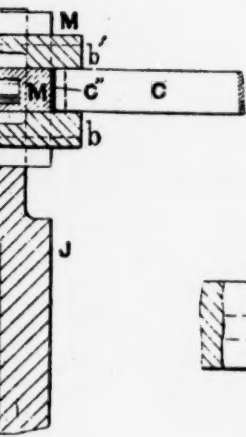


FIG. 5.



This drawing is a reproduction of the original on a reduced scale

1118
Defendant's Exhibit No. 21.

2-300

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

THIS IS TO CERTIFY that the annexed is a true copy from the

Records of this Office of the Complete Specification and Drawing

in the matter of the

British Letters Patent to

Sebastian Ziani de Ferranti,

dated May 25, 1903,

Number 11,921,

for

Improvements in and relating to the Electric Welding of
Tungsten Blades.

IN TESTIMONY WHEREOF I have hereunto set my hand
and caused the seal of the Patent Office to be affixed
at the City of Washington, this 24th day
of March, in the year of our Lord one
thousand nine hundred and nineteen and of
the Independence of the United States of America the
one hundred and forty-third.

J. M. Cley

Acting Commissioner of Patents.

N^o 11,921.—A.D. 1903.*Improvements in and relating to the Electric Welding of Turbine Blades.*

are "stepped" with regard to each other, the intervening projections of such blades thus following the shape of the turbine blades to be welded to them.

Dated this 25th day of May 1903.

MARKS & CLERK

18, Southampton Buildings, London, W.C.

13, Temple Street, Birmingham, and

30, Cross Street, Manchester,

Agents.



COMPLETE SPECIFICATION.

"Improvements in and relating to the Electric Welding of Turbine Blades." 10

I, SEBASTIAN MUANI DE FERRANTI, Engineer, of 31, Lyndhurst Road, Hampstead, London, N.W., do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described, and ascertained in and by the following statement: 15

The invention relates to improvements in and relating to methods of electrically welding turbine blades to the discs, drums or the like carrying them and has for its object to overcome the difficulties which have been experienced in electrically welding together two such parts differing considerably as regards their power of rising to the required welding temperature when heated at the point of junction, so that blade carrying elements with welded blades may be reliably produced in an inexpensive manner. 20

The main difficulty arises through the blades and their carriers differing as regards their power of conducting heat away from the welding point.

In the welding of a turbine blade to the carrier to which it is to be secured, it is found that the comparatively large volume of metal forming the carrier rapidly conducts heat away from the welding point, thus preventing the temperature of the carrier rising to the required extent and causing an unsatisfactory weld. 25

The invention, therefore, consists broadly in adjusting the volume of the blade carrying element in the neighbourhood of the welding point, so that approximately equal heating occurs in both faces to be welded. 30

Referring to the accompanying drawings which, with the exception of Figure 4, show the invention applied, by way of example, to a type of parallel flow turbine in which the blades are mounted on the edge of a wheel-like body, 35

Figure 1 is a part side elevation of such a wheel having cross grooves,

Figure 1^a being an edge view;

Figure 2 shows a similar edge view of a modification in which sets of intersecting grooves are adopted; 40

Figure 3 shows an edge view of a form having circumferential grooves,

Figure 3^a being a section on the line A A of Figure 3;

Figure 4 shows, in longitudinal sectional elevation, part of a drum carrier to which the blades are welded in accordance with one form of the invention;

Figures 5 and 6 show edge views of modifications in which holes are bored radially into the edge of the disc, while 45

Figure 7 is a part side elevation in which holes are bored through from face to face of the disc;

Figure 8 shows a sectional plan of a form of wheel built up of two dished discs, held apart at their circumferential portions by distance pieces. 50

Improvements in and relating to the Electric Welding of Turbine Blades.

Figure 8* being a scrap edge view to a larger scale;

Figure 9 is a similar sectional plan of a modified form of wheel built up of three discs, while

Figure 9* is a corresponding scrap edge view also to a larger scale;

Figure 10 shows a part sectional elevation of a wheel built up of two comparatively thick discs having notched edges,

Figure 10* being a scrap edge view, while finally

Figure 11 shows an edge view of a form of wheel built up of a series of "stepped" laminæ.

It will be seen that all the edge views are shown as developments for clearness of drawing and not as true projections.

The same reference symbols are, when possible, used in the accompanying drawings to denote similar parts.

In carrying out the invention according to the form shown in Figures 1 and 1*, the turbine wheel or disc is shown at *a*, cross grooves, *b*, being cut in its circumferential edge so as to leave projecting portions of metal, *c*, to which the turbine blades, *d*, are welded.

The same object is attained by cutting two intersecting sets of grooves, *e*, in the edge of the disc, as is shown in Figure 2, or by cutting circumferential grooves, such as *f*, completely round the edge (see Figures 3 and 3*.)

Figure 4 shows the invention, according to one form, applied to the case of a drum blade carrier, *a'*; the drum is grooved circumferentially with grooves, *f*, the intervening collars of metal being then cross-cut to form projecting teeth, *e'*, on which the blades are welded.

According to a modified form, radial holes, *h*, may be bored a short distance into the edge of the disc, these holes being either arranged in patterns so as to leave intervening projections of untouched metal to which the blades may be welded as shown in Figure 5, or arranged without particular reference to the position of the blades, (see Figure 6).

In Figure 7, a method is shown of removing metal in the neighbourhood of the welding point by boring holes, *i*, through (or partly through) from face to face of the disc at a radius slightly less than that of its outside edge.

The object to be kept in mind in this as in other modifications, is to remove sufficient metal to enable the temperature to rise to the welding point as explained above, whilst at the same time leaving sufficient areas untouched to ensure due mechanical strength in the welded joint.

Referring now to Figures 8 and 8*, a form of wheel is shown somewhat diagrammatically which is built up of two dished discs, *k*, of comparatively thin metal, held apart at their circumferential portions by one or more distance pieces such as *l*, disposed at a radius somewhat less than the maximum radius of the discs, the blades, *d*, being welded in position on their outside edges.

Figures 9 and 9* show a type of wheel generally similar to that last described but having an intermediate plane disc, *m*, in addition to the two dished discs, *k*; a portion, *n*, of the hub, *a*, is in this case made detachable so as to allow the different parts of the wheel to be assembled. Distance pieces, *l*, are indicated as before but any other convenient method of holding the discs in their correct relative position may be adopted.

In Figures 8 and 9, the dished discs, *k*, are indicated as secured to the hubs, *a*, by pressing the inner edges of these discs into grooves and subsequently ~~locking~~ over the hubs to hold the discs in place.

In the modification shown in Figures 10 and 10* two dished discs, *k*, are again employed but of thicker metal, their circumferential portions being brought into contact and cross grooves, *b*, being cut in their edges in accordance with the method described above with reference to Figures 1 and 1*.

Again, that portion of the disc carrying the blades, may be built up of a set of thin laminæ, *r*, (see Figure 11) the edges of which are notched as at *s*, the laminæ being assembled in such a way that the notches, *s*, are "stepped"

Improvements in and relating to the Electric Welding of Turbine Blades.

with regard to each other, so that the intervening projections of metal may follow the shape of the turbine blades to be welded to them.

Instead of notching the laminae, they may be prepared in accordance with other of the methods pointed out above, before being assembled in the manner indicated.

In an invention such as the present, it is not practicable to describe every method of carrying its broad underlying principle into effect, but the scope is sufficiently indicated by the many examples given above, and moreover it will be evident without further description, how the invention may be applied to the welding together of turbine blades and carriers of other forms than 10 those described above by way of example.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. In turbines, the method of welding the turbine blades to the element 15 carrying them, consisting in so adjusting the volume of metal in the blade carrier in the neighbourhood of the welding point, that approximately equal heating occurs in the two parts, substantially as described.

2. In turbines, blade carrying elements having blades welded thereupon in accordance with the method claimed in Claim 1. 20

3. In turbines, grooving the blade carrier in the neighbourhood of the welding point, substantially as and for the purpose described.

4. The bladed turbine element, hereinbefore described with reference to Figures 1 and 1^a of the accompanying drawings.

5. The bladed turbine element, hereinbefore described with reference to 25 Figure 2 of the accompanying drawings.

6. The bladed turbine element, hereinbefore described with reference to Figures 3 and 3^a of the accompanying drawings.

7. The bladed turbine element, hereinbefore described with reference to 30 Figure 4 of the accompanying drawings.

8. In turbines, forming holes in the blade carrier in the neighbourhood of the welding point, substantially as and for the purpose described.

9. The bladed turbine elements hereinbefore described with reference to Figures 5 and 6 of the accompanying drawings.

10. The bladed turbine element, hereinbefore described with reference to 35 Figure 7 of the accompanying drawings.

11. In turbines, building the blade carriers of comparatively thin parts across the non-touching edges of which the blades are welded, substantially as described.

12. The bladed turbine element, hereinbefore described with reference to 40 Figures 8 and 8^a of the accompanying drawings.

13. The bladed turbine element, hereinbefore described with reference to Figures 9 and 9^a of the accompanying drawings.

14. The bladed turbine element, hereinbefore described with reference to 45 Figures 10 and 10^a of the accompanying drawings.

15. In turbines, building the blade carriers of prepared laminae assembled in a "stepped" manner, substantially as and for the purpose hereinbefore described.

16. The bladed turbine element, hereinbefore described with reference to 50 Figure 11 of the accompanying drawings.

Dated this 24th day of February, 1904.

MARKS & CLERK,

18, Southampton Buildings, London, W.C.

13, Temple Street, Birmingham, and

30, Cross Street Manchester.

Agents.

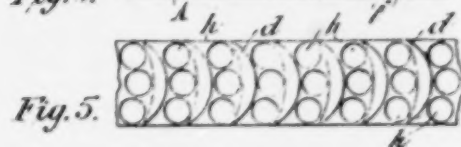
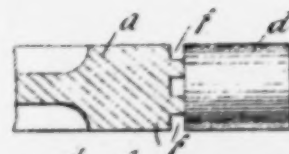
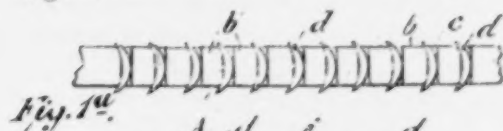
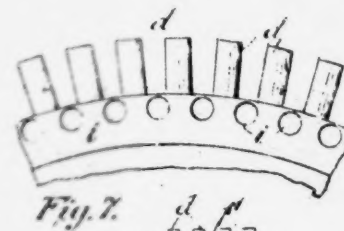
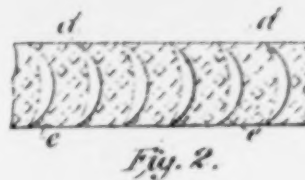
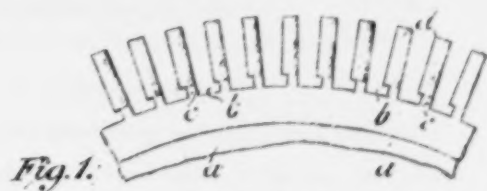


Fig. 3a.

Fig. 6.

Fig. 4.

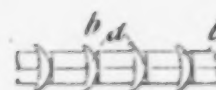
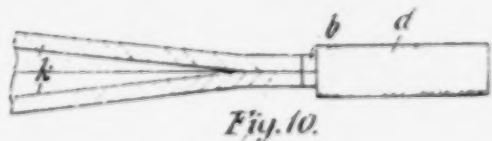
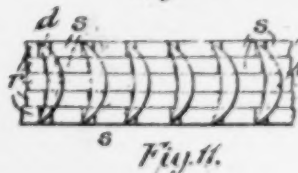
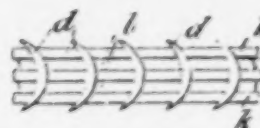
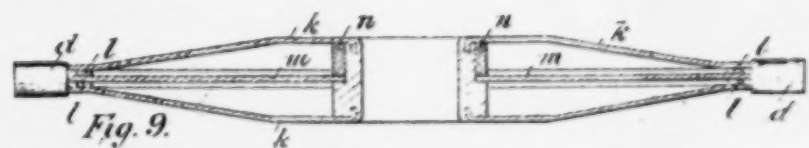
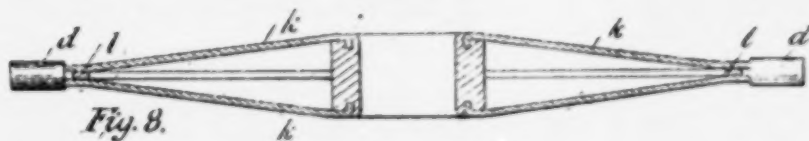


Fig. 10a.

N^o 22,981

A.D. 1903

Date of Application, 23rd Oct., 1903

Complete Specification Left, 25th July, 1904—Accepted, 25th Aug.^R, 1904—

PROVISIONAL SPECIFICATION

OCT 1 1904

U.S. PATENT OFFICE

Improvements in Welding by Electricity and Apparatus therefor.

I, JOHANN HARMATTA, of Kirchdrauf, in the Kingdom of Hungary, Engineer, do hereby declare the nature of this invention to be as follows:—

This invention relates to the production, by direct electric welding, of metal articles of all kinds, especially such as are made of thin sheet metal.

According to the invention one or both of the electrodes is or are not only utilized for supplying the electric current, but also for exerting pressure at the point at which the welding is to be effected, before and during the supply of electric current or only during the time of flow. To this end the part which supplies the electricity serves simultaneously as the means for effecting the mechanical operation, this arrangement giving rise to the most favourable results as regards the operation, since, as is well known, in every efficient method of welding, the parts to be joined after being brought to the proper temperature must be immediately hammered or subjected to compression in order to obtain a good joint.

In no one of the known electric welding processes, are the parts to be welded, during the operation of welding, pressed against one another by means of one or both of the electrodes in order to assist the welding operation. hitherto either no pressure at all has been made use of or pressure when used has been applied at some distance from the welding point or not upon centred electrodes pressing directly upon the parts to be heated. To sum up, in direct electric welding, pressure has never heretofore been applied by means of electrodes placed in the direction of flow of current directly over the surfaces of points to be welded.

The process forming the subject of this invention can be carried out in a number of ways, as the necessary pressure at the welding point can be obtained by any suitable known means for generating or transmitting pressure, for example, by means of a press, either directly or through the medium of lever transmission. Or, the pressure can be obtained by employing a hand lever by direct or indirect manual operation.

In carrying out the invention the metal parts (sheets or the like) the ends of which overlap are passed between the two electrodes, one of which is caused to exert pressure upon the parts to be welded either before the welding operation during the said operation; or both the electrodes can be utilized for obtaining the required pressure. This may advantageously be done, particularly in cases where it is required to continuously weld longitudinal, transverse and angular joints, by providing in intimate contact with each of the conductors, a fork furnished with an easily exchangeable roller electrode; or only the outer of the two roller electrodes can be made exchangeable. Furthermore, only the upper or lower electrode need be in the form of a movable roller, the other electrode being the fixed contact conductor.

The roller of the upper conductor is keyed upon a spindle which carries a driving pinion to which the motion of a suitably mounted hand wheel can be transmitted through the medium of a gear wheel; or the hand wheel can be directly mounted upon the spindle which it can thus drive without intermediate

[Prior Art.]

1134

Defendant's Exhibit No. 22.

No 22

2-200

UNITED STATES OF AMERICA

DEPARTMENT OF THE INTERIOR,

UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

THIS IS TO CERTIFY that the annexed is a photographic copy
from the Records of this Office of the Provisional Specification
Complete Specification and Drawing, in the matter of the

British Letters Patent to

Johann Harmatta,

dated October 23, 1903,

Number 22,981,

for

Improvements in Welding by Electricity and Apparatus
therefor.

IN TESTIMONY WHEREOF I have hereunto set my hand

and caused the seal of the Patent Office to be affixed
at the City of Washington, this 14th
of September, in the year of our Lord
thousand nine hundred and seventeen and
the Independence of the United States of America
one hundred and forty-second.

R. F. Parrott
Acting Commissioner of Patents

No 22,981.—A.D. 1903.

Improvements in Welding by Electricity and Apparatus therefor

gear. Furthermore, the spindle can have mounted upon its other end a pinion, bevel wheel driving disc or the like for mechanically driving the roller electrode where the automatic feeding of the parts to be welded by motive power is desired. The hand wheel is designed to increase or retard the rotation of the roller according to requirement, or to operate the said roller directly by hand. The retardation or acceleration of the motion of the spindle with a power drive can obviously be effected by other suitable means. The upper part of the forked piece carrying the roller electrode can be in the form of a rack with which engages a pinion carried by the conductor through the medium of a clamp, the said pinion being keyed upon a spindle which at its other end is provided with a hand lever. By raising or lowering the said hand lever the upper roller electrode can obviously be moved from, or approached towards, the lower electrode. Furthermore, by raising or lowering the forked piece of the lower conductor the lower exchangeable roller can be adjusted in position.

If, now, the materials to be welded be introduced between the two roller electrodes and current caused to flow, a continuous welding can be obtained, that is to say, an unbroken joint can be made, the upper rotating roller electrode pressing upon the lower fixed or rotatable roller electrode so that the two ends of the work to be welded are rigidly connected together.

Instead of gradually feeding the parts to be welded between the electrodes the electrical welding apparatus can be made to move relatively with the work, in this case fixed in position.

In cases where it is desired to weld metal sheets at single points only I advantageously make use of apparatus wherein the electrodes are in the form of rods or pins. The lower electrode is fitted in the lower conductor, whilst the upper electrode is carried by a yoke adapted to be turned around a spindle or axis by a hand lever in such a manner that the points of the electrodes can be approached towards, or moved away from, one another. If now, for example, two overlapping sheet metal ends to be welded are introduced between the electrodes, and the latter pressed towards one another and current allowed to flow, then a small, round and clean welding point is obtained which fully takes the place of a rivet. The pressure at the welding point at suitable intervals can be exactly regulated, that is to say, kept within proper limits, particularly in the case of welding thin vessels which cannot sustain any considerable pressure.

Dated the 20th day of October 1903.

G. F. REDFERN & Co.,
4, South Street, Finsbury, London
Agents for the Applicant.

COMPLETE SPECIFICATION.**"Improvements in Welding by Electricity and Apparatus therefor"**

I, JOHANN HARMATTA, of Kirchdrauf, in the Kingdom of Hungary, Engineer, do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:—

This invention relates to a method of electrically welding thin metal sheets of a thickness of about two millimeters.

It is well known that it is not possible, with electric welding processes

Improvements in Welding by Electricity and Apparatus therefor.

heretofore in vogue, to make a sound welding joint between sheets of such small thickness as above mentioned—that is to say, a joint which is completely tight throughout, without igniting and burning the material to be welded.

The inventor has found that this is due to the following facts. In the 5 known methods of welding it is usual to convey current to the articles to be welded (for example, iron rods, tyres, chains, links or the like) whereby the layer of air of more or less thickness, which is always present between the two objects to be welded, gives rise to an energetic formation of sparks, that is to say, a sparking area or an arc, this continuing until the bodies to be 10 welded are brought to the welding heat by the current, when they are pressed together for effecting their union.

This known method of welding does not differ essentially from the ordinary welding by fire heat, except that the bodies to be welded are heated by the electric current instead of by the gases of combustion derived from a suitable 15 combustible material; as soon as the necessary temperature is attained, however, the final jointing of the bodies is in both cases effected by mechanical pressure, such as pressing or hammering.

In the diagrammatic view shewn in Figure 1 of the accompanying drawing, and in which it is assumed that two sheets 1 and 2 are to be welded by the 20 ordinary method of electric welding, two electrodes *a* and *b* are placed opposite one another. The two metal sheets 1 and 2 are placed between the two electrodes and lie loosely upon one another (that is to say, they are not mechanically or otherwise pressed together) and are consequently separated by a layer of air 3. If, now, the circuit containing the electrodes *a* and *b* and 25 the two sheets be closed and the air layer 3 is of sufficient thickness, that is to say, the resistance of the air sufficiently great, no sparks or arcs are initially formed between the sheets. When, however, the sheets are approached towards one another, which is unavoidable for the final welding by pressure, hammering, &c., as above mentioned, then a point is reached at which the air resistance 30 between the two sheets to be welded is no longer sufficiently great to prevent the passage of electricity, whereby arcing or sparking takes place between the sheets and continues until an intimate contact between the two sheets takes place. When relatively thick sheets (as is shewn in Figure 1) are treated in this manner the formation of the arcs is not injurious, since the small 35 fusions 4, which are occasioned by the arcs or sparks, are not of sufficient depth to perforate or break through the thickness of the material. On the contrary an advantage is obtained as the sparks or arcs effect an alteration in the cross sectional area of the material thinning the same at the joint, that is to say, reducing the total cross sectional areas at the joint to an extent 40 such that, in certain circumstances, the resulting total thickness is equal to that of one of the sheets.

The conditions, however, are quite different when welding thin bodies, or a thin body and a thicker body as is diagrammatically indicated in Figure 2 45 of the accompanying drawing. In this figure, it is assumed that the thicker sheet 2 which under the conditions given in Figure 1 is not perforated by the fusion shewn at 4, is to be electrically welded to a thin sheet 5. In carrying out the process, when the two sheets 2 and 5 are approached towards one another at the required moment, as above described, the sparking through the air layer 3 causes the fusion of the metal sheets, the fusion taking place to 50 a depth which is of no consequence in the sheet 2, but which in the case of the sheet 5 is sufficient to completely perforate and burn it. The usual method of welding, therefore, is not practicable in the case of such thin sheets as that illustrated at 5, Figure 2, that is to say, a sheet of a thickness of 2 millimeters and under.

55 The novel method of electric welding forming the subject of this invention is characterised chiefly by the fact that it prevents the formation of such injurious arcing or sparking during the welding of thin bodies, thereby enabling

Improvements in Welding by Electricity and Apparatus therefor.

such bodies to be connected together by a perfectly sound weld, and also permitting of the sound welding of a thin body and a thicker body.

To prevent the formation of the injurious arcing or sparking according to this invention, I exert upon the superposed metal plates 4 and 5 (Figures 4 and 5) a pressure which varies in accordance with the articles to be welded, this pressure being exerted by the electrodes *a*, *b*, and being supplemented, if desired by that obtained by other means hereafter to be described. This pressure has for its object to bring the metal parts to be joined into such intimate contact that the layer of air existing between them is destroyed as far as possible. The two parts to be welded are by this means formed so as to say to a single body mechanically. This is of particular importance when two very thin sheets are to be welded together, for, as is well known, thin sheets always possess a more or less wavy form, and cannot be manufactured with as level surfaces as is the case with thicker sheets. Such sheets, therefore, when they are superposed without mechanical pressure do not lie closely upon one another, but by reason of their irregular wavy shape form a number of air spaces (Figure 3), which, when an electric current is passed through them, are very favorable to the formation of sparks and arcs.

After the metal articles to be welded are treated in the manner above described, that is to say, tightly pressed together by mechanical pressure so as to prevent the existence of air air layer between them, the electric circuit is closed, whilst the surface pressure is maintained.

At those points at which the electrodes *a*, *b* exert their pressure (Figures 4 and 5), that is to say, at which the current can flow through the two bodies to be welded without having to perforate an air layer and form sparks, the metal is heated up to the welding heat. As soon as this heat is obtained, the continuous pressure effects the desired union, that is to say, the welding of the two metal bodies 5 and 6, without the occurrence of damage arising from the perforation, burning, &c. of the bodies, even should these be composed of very thin material. It is furthermore to be noted that the pressure which is exerted upon the bodies to be welded, both anterior to, and during, the welding operation, and which pressure can be regulated to suit the character of the metal bodies, is adjusted in accordance with the actual thickness of the sheets. Thicker sheets or bodies do not require so great a pressure as thinner sheets, since, as above mentioned, they possess a more even regular surface, and when superposed can easily be closed so as to prevent the existence of injurious air layers. As the essential requirement is that the metal bodies to be united shall be tightly pressed together before welding, in order to prevent the perforation of the thin body by the electric current, it will be clear that the process is applicable not only to sheets of equal thicknesses, but also to the welding of a thin sheet and a thicker metal article without the liability of the burning of the former.

It will be obvious that the pressure can be exerted either by one of the electrodes only or by both the electrodes.

For carrying out the process when it is applied to the continuous welding of longitudinal, transverse and edge joints, the device illustrated in Figures 6 and 7 of the accompanying drawing can be used. Figure 6 indicates a front view of the device, and Figure 7 a sectional side view thereof.

Between the two current conductors *c*, *d* (Fig. 7) and in intimate contact therewith, are arranged forks *e*, *f*, each of which is furnished with an easily exchangeable roller-electrode *g* or *h*; or only the lower of the two electrodes may be made exchangeable. Furthermore, only the lower or the upper electrode need be in the form of a movable roller, the other electrode being the fixed current conductor. The roller *g* of the upper conductor *c* is keyed upon a spindle *i*, which carries a toothed pinion, to which the motion of a suitably mounted hand-wheel *l* can be transmitted through the medium of a gear wheel *m*; the hand-wheel can be directly mounted upon

Improvements in Welding by Electricity and Apparatus therefor.

the spindle, that is to say, can be directly driven from the spindle *i*. Furthermore the spindle *i* can have mounted upon its other end a pinion, bevel wheel, driving disc or the like for mechanically driving the roller-electrode where the automatic feeding of the parts to be welded by motive power is desired. The hand-wheel is designed to increase or retard the rotation of the roller *g* according to requirement, or to operate the said roller directly by hand. The retardation or acceleration of the motion of the spindle *i* with a power drive can obviously be effected by other suitable means. The upper part of the fork carrying the roller-electrode *g* can be in the form of a rack *n* as shown, the said rack engaging a pinion *p* carried by the conductor *e* through the medium of a clamp *u*, and keyed upon a spindle *q* having a hand lever *r*. By raising or lowering the hand lever *r* the upper roller-electrode *g* can be moved from, or approached towards, the lower electrode *h*. Furthermore, by raising or lowering the fork *f* in the conductor *d* the lower exchangeable roller *h* can be adjusted in position.

If, now, the materials to be welded be introduced between the two roller electrodes and current caused to flow, whilst the pressure is maintained, a continuous welding can be obtained, that is to say, an unbroken sound joint can be made, even in the case of thin sheets.

Instead of gradually feeding the parts to be welded between the electrodes the electrical welding apparatus can be made to move relatively with the work, in this case fixed in position.

In cases where it is desired to weld metal sheets at single points only I advantageously make use of apparatus wherein the electrodes are in the form of rods or pins. Such an arrangement is shown in side elevation in Figure 8. *a* and *b* represent the pin electrodes, the lower *b* being fitted in the conductor *d* whilst the upper *a* is carried by a yoke *s* adapted to be turned around a spindle or axis *u* by a hand-lever *t* in such a manner that the points of the electrodes can be approached towards, or moved away from, one another. If now, for example, two overlapping sheet metal ends to be welded be introduced between the electrodes *a*, *b*, and the latter pressed towards one another and current allowed to flow, then a small, round and clean welding point is obtained which fully takes the place of a rivet. The pressure at the welding point at suitable intervals can be exactly regulated, that is to say, kept within proper limits, particularly in the case of welding thin vessels which cannot sustain any considerable pressure.

Having now particularly described and ascertained the nature of the said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. A method of electrically welding thin metal sheets or thin and thick sheets or bodies, wherein the said sheets are superposed and subjected to pressure at the point to be welded, the pressure being maintained during the subsequent heating of the sheets or bodies by an electric current, substantially as and for the purpose hereinbefore described.

2. In electrically welding thin sheets and bodies, the arrangement wherein pressure is exerted upon the bodies at the points to be welded both before and during the passage of the electric current by means of oppositely placed pin electrodes controlled by a lever or the like, substantially as hereinbefore described.

3. In electrically welding thin sheets and bodies, the arrangement wherein pressure is exerted upon the bodies, both before and during the passage of the electric current, by oppositely placed electrodes, one of which is in the form of a movable roller and the other of a fixed current conductor adapted to receive the bodies to be welded, or both of which are in the form of roller-electrodes, one or both of which is or are adapted to effect the automatic feed

Improvements in Welding by Electricity and Apparatus therefor.

of the work whilst maintaining the necessary pressure, substantially as hereinbefore described.

4. Apparatus for electrically welding thin bodies or thin and thick bodies constructed substantially as hereinbefore described and illustrated in the accompanying drawings.

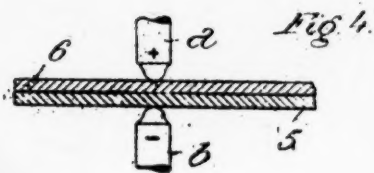
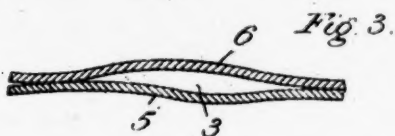
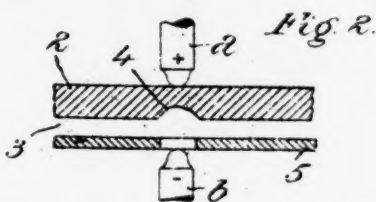
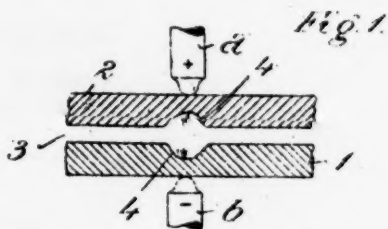
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Dated this 25th day of July, 1904.

G. F. REDFERN & Co.
4, South Street, Finsbury, London
Agents for the Applicant.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1904.

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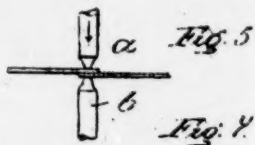


Fig. 6.

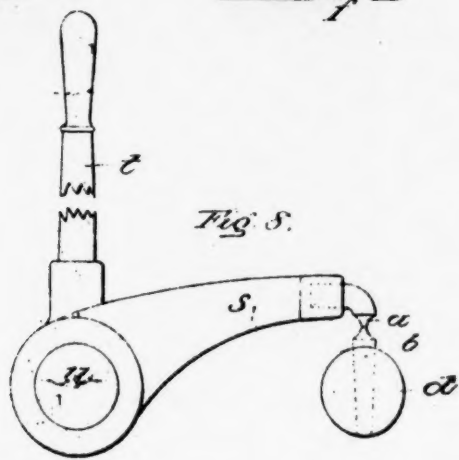
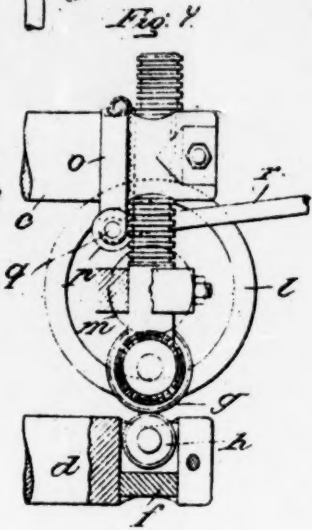
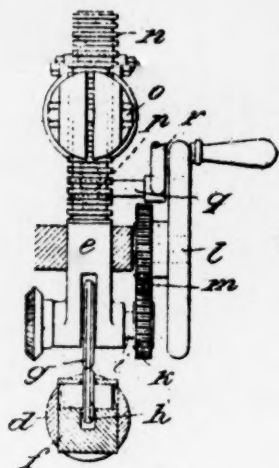


Fig. 8.

Defendant's Exhibit No. 23.

2-280.

No. 23

UNITED STATES OF AMERICA,

DEPARTMENT OF THE INTERIOR,

UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

THIS IS TO CERTIFY that the annexed is a true copy from the
Records of this Office of the Specification and Drawing, in the
matter of the

French Letters Patent to

EDEL,

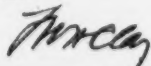
Dated October 13, 1903

Number 335,889, *

Precede et dispositif pour la fabrication d'objets metalliques
tous genres, principalement d'objets composes de parties minces,
epaisseurs differentes, par soudage electrique direct.

IN TESTIMONY WHEREOF I have hereunto set my hand

and caused the seal of the Patent Office to be affixed
at the City of Washington, this 24th day
of March, in the year of our Lord one
thousand nine hundred and nineteen and of
the Independence of the United States of America the
one hundred and forty-third.



Acting Commissioner of Patents.

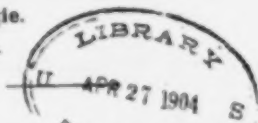
BREVET D'INVENTION

du 13 octobre 1903.

VIII. — Mines et métallurgie.

3. — MÉTAUX AUTRES QUE LE FER.

N° 335.889



Brevet de quinze ans demandé le 13 octobre 1903, par **M. Wilhelm EGEL** résidant en Allemagne.

Procédé et dispositif pour la fabrication d'objets métalliques de tous genres, principalement d'objets composés de parties minces, d'épaisseurs différentes, par soudage électrique direct.

Déposé le 21 décembre 1903; publié le 18 février 1904.

La présente invention a pour objet un procédé pour la fabrication d'objets métalliques de tous genres, particulièrement aussi de ceux qui se composent de parties d'épaisseurs différentes, par soudage électrique direct. Le nouveau procédé consiste en ce que l'électrode qui s'applique contre le corps métallique qui a la plus grande épaisseur est soumise pour une tension relativement faible à une quantité de courant plus grande par unité de temps que l'électrode qui s'applique contre le corps métallique (fer-blanc, etc.) d'une épaisseur moindre. Un calcul toujours exact des proportions de courant évite que le corps métallique le plus mince ne soit brûlé, c'est-à-dire détérioré.

On peut exécuter le procédé de différentes façons; cependant, on donne la préférence à un dispositif qui convient particulièrement pour le but. Ce dispositif est caractérisé en principe en ce qu'un des deux conducteurs appartenant au circuit secondaire d'un transformateur possède une section de passage réglable, afin de pouvoir amener, à l'un ou à l'autre des corps métalliques qu'il s'agit de souder, les différentes quantités de courant, selon les besoins actuels du travail.

Au dessin, la fig. 1 montre que pour le

soudage de tôles, etc., d'épaisseurs différentes les deux électrodes sont alimentées par des courants d'intensités différentes et cette manière de disposer des électrodes a surtout pour but de remplacer sur les objets traités certaines rivures par des soudures électriques.

La fig. 2 est une vue schématique d'un dispositif qui peut être employé avantageusement pour l'exécution du procédé, surtout lorsqu'il s'agit d'un soudage progressif continu de sutures longitudinales, transversales et circulaires, pour des récipients en fer-blanc et objets métalliques de tous genres.

Les fig. 3 et 4 représentent en élévation de face et en élévation de côté une exécution pratique des conducteurs qui amènent le courant aux électrodes.

Bien que pour des sections métalliques différentes plus grandes, la circonstance que, dans les machines à souder existantes, les deux pôles ne fournissent que la même quantité d'électricité de la même tension, ne soit pas aussi grave, le cas est tout à fait différent lorsqu'il s'agit de souder des objets de la matière la plus mince avec d'autres d'une épaisseur considérablement supérieure, comme cela a lieu, par exemple, lorsqu'il s'agit de souder du fil métallique ou de la tôle, avant,

par exemple, 4 millimètres d'épaisseur, ou du fer-blanc n'ayant que 0,3 millimètres d'épaisseur. Si on amenait des quantités de courant égales, le fer-blanc de 0,3 millimètres serait brûlé depuis longtemps, avant que le fil métallique de 4 millimètres soit seulement devenu rouge.

Suivant le présent procédé, on supprime cet inconvénient en amenant, à une tension égale des quantités de courants différentes par unité de temps, par exemple, comme le montre la fig. 1, pour une électrode *a* 1.000 et pour l'autre à 3.000 ampères, avec une tension de 0,3 - 4 volts. Il serait possible d'employer dans ce but deux circuits qui amènent aux endroits voulus une quantité différente d'ampères. Pour les applications pratiques cependant il convient d'employer un seul circuit et des essais en ce sens ont démontré que pour cela le circuit secondaire d'un transformateur qui réduit la tension à une faible quantité de volts, convient spécialement.

A la fig. 2, *c* désigne l'enroulement primaire et *d* l'enroulement secondaire d'un transformateur.

L'un des conducteurs, *e f* (ou bien les deux) ne constitue pas, en un certain endroit, une pièce pleine, mais est interrompu en cet endroit, et entre les deux extrémités du conducteur sont intercalées des lamelles métalliques parallèles *g*, de préférence en cuivre, dont la section totale est exactement égale à la section du conducteur proprement dit. On peut, selon les exigences actuelles du travail, enlever un nombre plus ou moins grand de ces lamelles pour réduire ainsi la section du conducteur, c'est-à-dire pour déterminer le passage d'une quantité d'électricité, par unité de temps, exactement fixée d'avance. Comme de cette façon on réduit, selon les besoins, l'arrivée de courant à l'une ou à l'autre des électrodes, on peut amener en même temps au blanc-soudant les deux sections qu'il s'agit de souder l'une à l'autre. Par conséquent la possibilité de brûler le corps métallique le plus mince disparaît complètement; et pour prouver qu'un réglage de l'arrivée du courant est possible dans les limites les plus larges, on peut à titre démonstratif réussir à brûler d'abord la section la plus forte en ébranchant à souder deux sections d'épaisseurs différentes.

Les essais faits ont démontré que des courants d'une si faible tension et d'une intensité relativement grande, sont très inertes, de sorte que l'équilibre de courant au point de soudure ne se produit pas tout de suite, de sorte qu'il est possible qu'il se produise une retenue de courant dans un des conducteurs.

Pour des applications pratiques on peut disposer l'arrangement pour régler le courant de la manière indiquée aux fig. 3 et 4.

La source de courant est reliée à deux supports *i* ayant une forme et une longueur correspondantes et dans ces supports sont disposés deux bons conducteurs électriques *e f* d'aussi peu de résistance que possible. Dans la forme d'exécution représentée aux fig. 3 et 4 le conducteur supérieur seul est muni d'un dispositif réglable de courant. A cet effet, il est muni d'une rainure dans laquelle sont placées les extrémités de diverses barres *g* ou de lamelles, câbles, etc., de conductibilité également bonne, et convenables, ayant une section appropriée et présentant peu de résistance au passage du courant. L'autre extrémité de ces barres, plaques, etc., se trouve en contact intime dans une rainure de la même forme pratiquée dans l'extrémité de la source de courant *i*. Les extrémités des conducteurs *e f* qui sont éloignées de la source de courant, sont munies des électrodes *a b* qui de préférence ont la forme de galeats; l'une des électrodes peut être pressée au moyen d'un levier ou autre dispositif analogue, vers l'autre, ou bien les deux électrodes peuvent être pressées également l'une vers l'autre.

Lorsque l'admission du courant aux deux électrodes doit être changée, on enlève, selon le besoin, un nombre plus ou moins grand des barres, plaques ou lamelles *g* du conducteur qui est destiné à fournir le courant plus faible (dans le cas représenté le conducteur supérieur) de façon à augmenter sa résistance, de sorte qu'une quantité moindre de courant passe par le conducteur respectif à l'électrode.

Naturellement on peut aussi produire le réglage de la quantité de courant, aux endroits de la soudure qui exigent moins de courant, au moyen d'autres dispositifs qui compensent qui réduisent ou augmentent le passage du courant.

L'opération, lorsqu'il s'agit de souder des

corps métalliques d'épaisseurs différentes, est la suivante :

On dispose les parties en tôle ou autres qu'il s'agit de souder les unes au-dessus ou à côté des autres, après quoi on serre les électrodes (à galet ou autres) et on ferme le circuit primaire. Le courant secondaire formé par suite de cette fermeture du circuit par le transformateur passe par le conducteur à section variable aux électrodes et de là dans la matière qu'il s'agit de souder, et ce circuit secondaire est achevé par la section qu'il s'agit de souder, c'est-à-dire au point de sou-

temps qu'à l'électrode appliquée contre le corps métallique fer-blanc ou autre de section moindre.

1° L'admission de courant aux électrodes a lieu au moyen de deux conducteurs appartenant au circuit secondaire d'un transformateur et possédant une résistance faible, et dont l'un, ou éventuellement les deux, ont une section réglable suivant les besoins, afin de pouvoir amener des quantités de courants différentes à l'un ou à l'autre des corps métalliques qu'il s'agit de souder et qui ont des sections différentes.

3° Dans le circuit de l'un des conducteurs sont intercalées des lamelles métalliques, de préférence en cuivre, facilement détachables et portées par des sabots convenables et dont le nombre, variable suivant les besoins du travail, détermine la quantité de courant passant par unité de temps.

W. EGEL.

PAR PROC. 20. 10.

E. BELIN.

RÉSUMÉ :

1° Un procédé pour fabriquer des objets métalliques de tous genres, et particulièrement des objets composés de parties relativement minces, d'épaisseurs différentes, par soudage électrique direct, caractérisé en ce qu'à l'électrode qui s'applique contre le corps métallique de section plus grande (fer-blanc, etc.), on amène, avec la même tension, une quantité de courant plus grande par unité de

Fig. 1

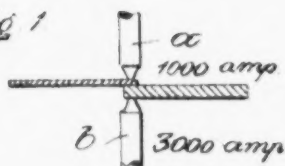


Fig. 2

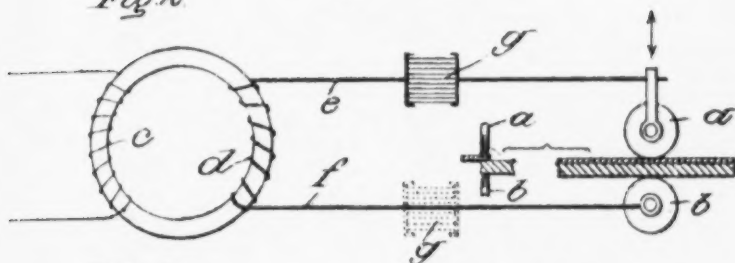


Fig. 3

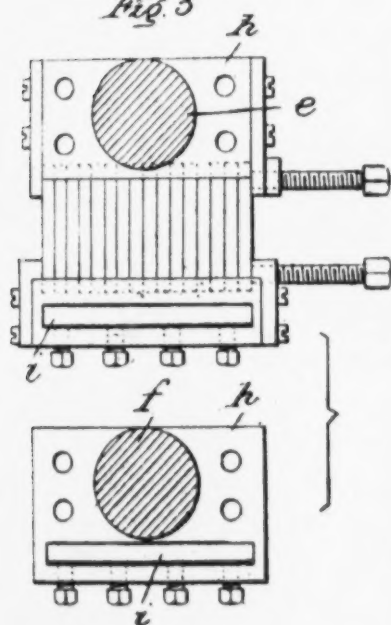
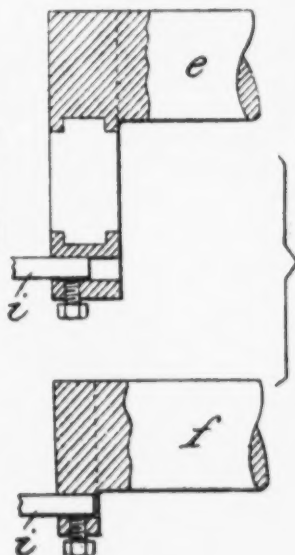


Fig. 4





TRANSLATION.

FRENCH PATENT No. 335,889—WILHELM EGEL—*October 13, 1903*

Process and Means for the Manufacture of Metal Objects of All Kinds, Principally Objects Composed of Thin Parts, of Different Thicknesses, by Direct Electric Welding.

(DELIVERED DECEMBER 21, 1903; PUBLISHED FEBRUARY 18, 1904)

The present invention has for its object a process for the manufacture of metallic objects of all kinds, particularly those which comprise parts of different thicknesses, by direct electric welding. The new process consists in that the electrode, which is applied against the metallic body which has the greatest thickness, is subjected, for a relatively weak potential, to a greater quantity of current per unit of time than the electrode, which is applied against the metallic body (tin, etc.) of less thickness. An always exact calculation of the proportions of current prevents the thinner metallic body from being burned, that is to say, deteriorated.

The process may be carried out in different ways; however, preference is given to a means which is particularly suited for the object in view. This means is characterized, in principle, by the fact that one of the two conductors, belonging to the secondary circuit of a transformer, possesses a section of variable size, in order to be able to feed, to one or the other of the metallic bodies to be welded, the different quantities of current, according to the actual needs of the work.

In the drawing, Fig. 1 shows that for the welding of sheets, etc., of different thicknesses, the two electrodes are fed by currents of different intensities, and this manner of arranging the electrodes has especially for its object to substitute electric welds for rivets in the objects treated.

Fig. 2 is a diagrammatic view of a means which may be employed advantageously to carry out the process, especially when it relates to a progressive continuous welding of longitudinal, transverse and circular seams, for tin vessels and metallic objects of all kinds.

Figs. 3 and 4 represent in front elevation and in side elevation a practical embodiment of the conductors which feed the current to the electrodes.

Although for larger different metallic sections, the circumstances that, in existing welding machines, the two poles only furnish the same quantity of electricity at the same potential, is not of so much importance, the case is entirely different when it relates to welding objects of very thin material to others of a considerably greater thickness, as is the case, for example, when a metallic wire or sheet of, for instance, 4 millimeters thickness, is to be welded to sheet tin having only 0.3 millimeters of thickness. If equal quantities of current were fed, the sheet tin of 0.3 mms. would be burned

long before the metallic wire of 4 mms. was even heated to red heat.

According to the present process this difficulty is overcome by feeding, at equal potential, different quantities of current per unit of time, for example, as shown in Fig. 1, for one electrode *a*, 1,000 amperes, and for the other *b*, 3,000 amperes, with a potential of 0.5-4 volts. It would be possible to use for this purpose two circuits which would feed at the desired points a different quantity of amperes. For practical applications, however, it is sufficient to employ a single circuit, and experiments along this line have demonstrated that, for that, the secondary circuit of a transformer, which reduces the potential to a small quantity of volts, is particularly suitable.

In Fig. 2, *c* indicates the primary winding and *d* the secondary winding of a transformer.

One of the conductors *e f* (or else both of them) does not constitute, at a certain place, a solid piece, but is interrupted at that place, and between the two ends of the conductor are interposed parallel metallic plates *g*, preferably of copper, the total section of which is exactly equal to the section of the conductor proper. According to the actual exigencies of the work, a greater or less number of these plates may be removed, to thus reduce the section of the conductor, that is to say to permit the passage of a quantity of electricity, per unit of time, exactly determined in advance, as in this way, the arrival of current at one or the other of the electrodes is reduced, as needed, sections which are to be welded can be brought at the same time to white heat the two. In consequence, the possibility of burning the thinner metallic body disappears completely, and to prove that a regulation of the arrival of the current is possible within the widest limits, it is possible, by way of experiment, to burn first the thicker section in trying to weld two sections of different thicknesses.

The experiments made have shown that currents of such a low potential and of a relatively high intensity, are very inert, so that the equilibrium of the current at the point of the weld is not produced at once, whereby it is possible that there is produced a retention of the current in one of the conductors.

For practical applications the means for regulating the current may be arranged as shown in Figs. 3 and 4.

The source of current is connected to two supports *i*, having corresponding shape and length, and in these supports are placed two good electric conductors *e, f*, of as little resistance as possible. In the embodiment represented in Figs. 3 and 4, the upper conductor *e* only is provided with a current regulator. To this end, it is provided with a groove, in which are placed the end of several bars *g*, or little blades, cables, etc., of equally good conductivity, having an appropriate section and presenting little resistance to the passage of the current. The other end of these bars, plates, etc., is in intimate contact in a groove of the same shape formed in the end of the source of current *i*. The ends of the conductors *e, f*, which are

furthest from the source of current, are provided with the electrodes, *a*, *b*, which preferably are in the form of rollers; one of these electrodes may be pressed, by means of a lever or other similar device, towards the other, or else the two electrodes may be equally pressed the one towards the other.

When the admission of the current to the two electrodes is to be changed, there is removed, as needed, a greater or less number of the bars, plates, or blades *g* of the conductor which supplies the weaker current, (in the case represented, the upper conductor), so as to increase its resistance, whereby a less quantity of current passes through the respective conductor to the electrode.

Naturally, the regulation of the amount of current can also take place at the places of welding which require less current, by means of any other devices which reduce or increase the flow of the current. The operation, when it has to do with welding metal objects of different thicknesses, is as follows:

The sheet metal, or other pieces, to be welded, are placed one above or at the side of the other, after which the electrodes (rollers or not) are applied and the primary circuit is closed. The secondary current generated in consequence of this closing of the primary, passes through the conductor of variable section to the electrodes, and, from there, into the material which is to be welded, and this secondary circuit is completed by the section which is to be welded, that is to say, at the point of weld.

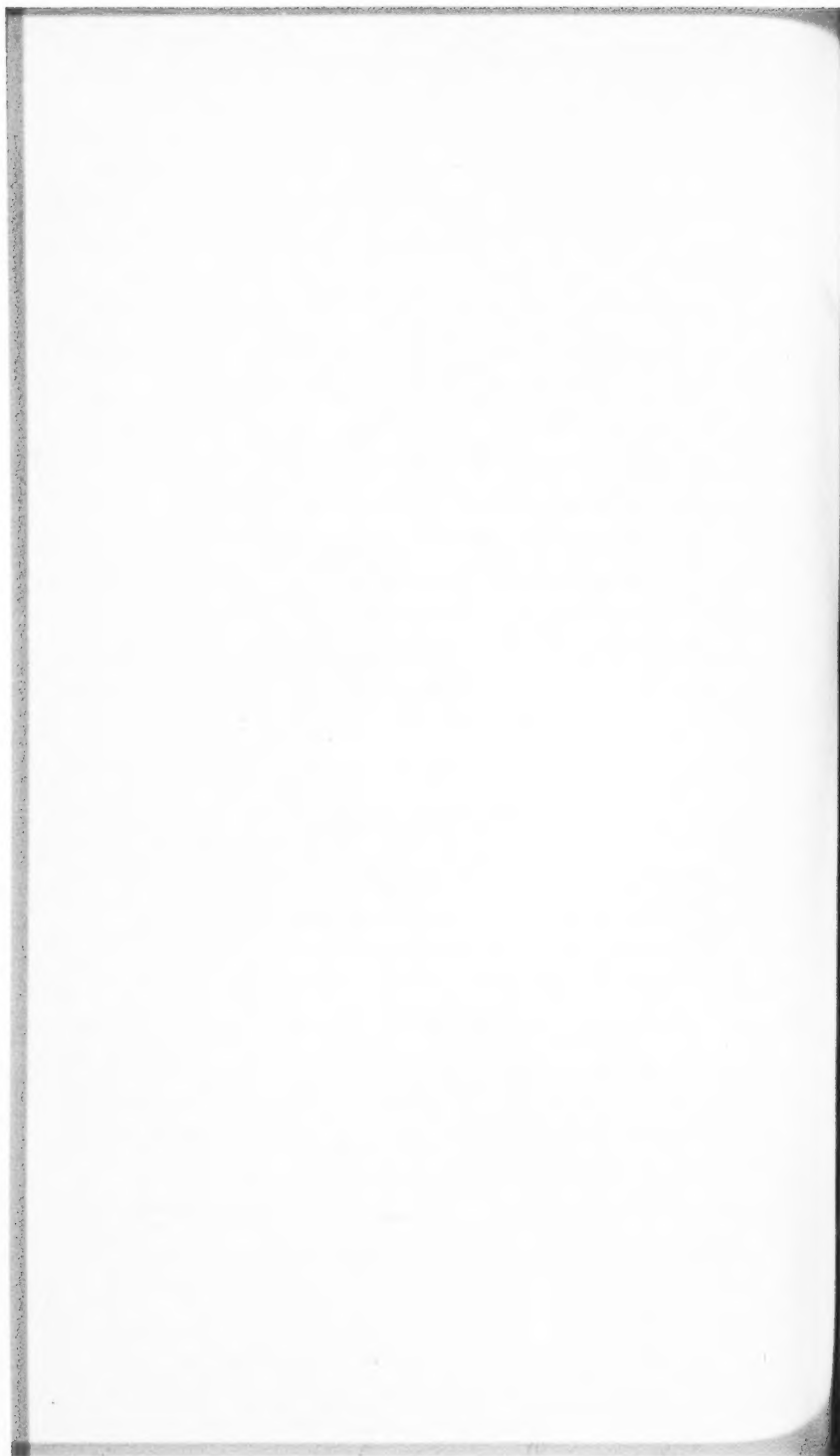
CLAIMS.

1. A process for manufacturing metallic objects of all kinds, and particularly objects composed of relatively thin parts, of different thicknesses, by direct electric welding, characterized by the fact that, to the electrode which is applied against the metal body of greater section, (tin, etc.), there is supplied, at the same potential an amount of current greater per unit of time than to the electrode applied against the metal body, (tin or the like), of less section.

2. The admission of current to the electrodes takes place by means of two conductors belonging to the secondary circuit of a transformer and possessing a feeble resistance, and one of which, or in some cases both, has or have a variable section according to the requirements, in order to be able to feed different quantities of current to the one or the other of the metal bodies to be welded and which have different sections.

3. In the circuit of the one of the conductors are interposed some metallic blades, preferably of copper, easily detachable and carried by suitable shoes, and the number of which, variable according to the needs of the work, determines the quantity of current flowing per unit of time.

W. EGEL.
By E. BLETRY.



Defendant's Exhibit No. 25.

2-220.

No 25

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

THIS IS TO CERTIFY that the annexed is a true copy from the
Records of this Office of the Specification and Drawing, in the
matter of the

French Letters Patent to

EGEL,

Dated October 13, 1903

Number 336,187,

Procede et dispositif pour la fabrication d'objets metalliques
tous genres, principalement des objets en feuilles extremement
minces par soudage electrique direct.

IN TESTIMONY WHEREOF I have hereunto set my hand
and caused the seal of the Patent Office to be affixed
at the City of Washington, this 24th day
of March, in the year of our Lord one
thousand nine hundred and nineteen and of
the Independence of the United States of America the
one hundred and forty-third.

Frederick

Acting Commissioner of Patents

OFFICE NATIONAL DE LA PROPRIÉTÉ INDUSTRIELLE.

BREVET D'INVENTION

du 13 octobre 1903.

VIII. — Mines et métallurgie.

3. — MÉTAUX AUTRES QUE LE FER.



N° 336.187

Brevet de quinze ans demandé le 13 octobre 1903, par M. Wilhelm EGEL résidant en Allemagne.

Procédé et dispositif pour la fabrication d'objets métalliques de tous genres, principalement des objets en feuilles extrêmement minces par soudage électrique direct.

Delivré le 7 janvier 1904; publié le 1^{er} mars 1904.

La présente invention a pour objet un procédé pour la fabrication d'objets métalliques de tous genres, principalement d'objets en feuilles extrêmement minces, par soudage électrique direct. Le nouveau procédé consiste en ce que l'une des électrodes ou même les deux ne servent pas seulement à amener le courant électrique, mais sont utilisées également pour exercer avant et pendant l'admission du courant électrique, ou bien seulement au moment de cette admission, une pression plus ou moins forte sur le point où doit avoir lieu le soudage. Par conséquent le corps qui conduit l'électricité constitue en même temps l'organe mécanique, de sorte qu'on obtient les conditions de travail de beaucoup les plus favorables, parce que dans chaque procédé de soudage régulier il faut immédiatement, ainsi qu'il est connu, marteler énergiquement ou comprimer le point de soudure amené à la température voulue, pour obtenir une soudure irréprochable.

Or, dans aucun des procédés de soudage électrique connus les corps qu'il s'agit de souder ne sont pendant le soudage pressés solidement l'un sur l'autre par une des électrodes ou par les deux pour favoriser le soudage. Jusqu'à présent on n'exerçait aucune

action de compression, ou bien elle avait lieu à une certaine distance du point où s'effectuait le soudage, mais non au moyen d'électrodes centrées, comprimant directement le point qu'il s'agit de chauffer. En un mot, jusqu'à présent on n'a jamais exercé une pression lors du soudage électrique, au moyen d'électrodes, disposées dans la direction du courant, immédiatement au-dessus de la surface de soudure ou du point de soudure.

Pour exécuter ce procédé on peut se servir de différents dispositifs parce que la pression nécessaire sur le point de soudure peut être effectuée au moyen de tous les dispositifs auxiliaires techniques, capables de produire ou de transmettre une pression, par exemple au moyen d'une presse, directement ou par transmission par levier. Cependant ce travail peut être effectué aussi simplement au moyen de leviers à main ou par l'action humaine directe ou indirecte.

À ce dessin :

La fig. 1 représente le soudage effectué avant le présent procédé, de deux feuilles de même épaisseur, d'une manière intermittente ou par endroits.

La fig. 2 est une élévation de face.

La fig. 3 est une élévation de côté d'un

dispositif de soudage électrique à fonctionnement continu dans lequel l'action de pression est exercée par des électrodes à galet, de sorte que successivement les divers points du joint qu'il s'agit de souder sont réunis avec une consommation minima de courant.

La fig. 4 représente le soudage du joint longitudinal d'un corps creux cylindrique ou conique suivant le nouveau procédé.

La fig. 5 est une élévation de côté d'un dispositif de soudage déjà indiqué à la fig. 1 et dans lequel on se sert, pour exercer la pression, d'électrodes en forme de tétons façonnés, suivant les besoins, et qui peuvent être préparés pour des surfaces de contact aussi restreintes que possible.

La fig. 6 représente deux formes pratiques d'électrodes qui se touchent à leurs extrémités.

Ainsi que le montre la fig. 1, on introduit les deux corps métalliques (fer-blanc ou autre) dont les extrémités se reçoivent, entre les deux électrodes *a b*. De ces électrodes l'une est déjà appliquée légèrement avant le soudage, ou seulement pendant le soudage, ainsi qu'il est indiqué par une flèche, sur l'autre électrode, ou bien les deux électrodes peuvent exercer ensemble une action de pression sur les objets qu'il s'agit de souder.

Pour l'exécution du procédé on peut, lorsqu'il s'agit d'une action continue du soudage pour des jonctions longitudinales, transversales et en rond, employer avantageusement le dispositif représenté aux fig. 2 et 3 du dessin.

Dans les deux conducteurs de courant *c d* (fig. 3) sont insérés, de façon à entrer en contact intime avec ces conducteurs, des organes en forme de fourche *e f*, dont chacun est muni d'une électrode à galet *g* ou *h*, facile à changer; on peut, d'ailleurs, disposer seulement l'électrode inférieure par exemple de façon amovible. De même on peut aussi donner à l'électrode inférieure ou supérieure seule la forme de galet mobile, tandis que l'autre électrode constitue le conducteur de courant établi d'une manière fixe.

Le galet *g* du conducteur supérieur *c* est claveté sur un axe *i* qui est muni d'une roue dentée droite *k*, sur laquelle le mouvement du volant à main *l* communique son mouvement

volant à main peut encore être monté directement, c'est-à-dire sans transmission sur l'arbre *g*. En outre l'arbre *i* peut être muni de 55 l'autre côté d'une roue dentée droite, d'une roue conique, d'une poulie de commande, etc., qui sert à actionner mécaniquement l'électrode à galet *g*, dans le cas où on désire un aménagement automatique des objets qu'il s'agit de souder par une force motrice. Le volant à main 60 est destiné à accélérer ou à retarder le mouvement de rotation du galet *g* suivant les besoins, ou bien à actionner en général le galet à la main. Le retard ou l'accélération 65 du mouvement de l'axe *i*, lorsque le mouvement est produit d'une manière mécanique, peuvent naturellement être produits par d'autres dispositions mécaniques. La partie supérieure de la fourche qui porte l'élec- 70 trode *g* est formée dans ce cas en crémaillère, dans laquelle engrene un pignon *p*, monté au moyen d'un collier *o* sur le conducteur *c* et qui est claveté sur un arbre *q* dont l'extrémité extérieure est munie d'un levier *a* 75 poignée *f*. En élevant ou en abaissant le levier *a* on peut donc écarter ou rapprocher l'électrode à galet supérieure *g* de l'électrode à galet inférieure *h*. En outre on peut, en élevant ou en abaissant la fourche *f* dans le 80 conducteur *d*, élever ou abaisser le galet inférieur amovible *h*.

Si alors on amène entre les deux électrodes à galet *g* les bords de la matière qu'il s'agit de souder et qu'on ferme le circuit, on peut obtenir de cette façon un soudage continu, c'est-à-dire une jonction non interrompue, tandis que l'électrode à galet supérieure *g* peut s'appliquer à volonté sur l'électrode à galet inférieure *h* qui est fixe, ou bien également mobile, 90 de sorte que les deux bords de matière qu'il s'agit de souder se trouvent réunis d'une manière solide.

Au lieu d'amener successivement les objets qu'il s'agit de souder entre les électrodes on peut aussi disposer de façon à pouvoir se déplacer l'appareil électrique à souder en regard des objets fixes.

Lorsqu'il s'agit, par exemple, de souder des fer-blancs seulement sur certains points 100 on peut employer avantageusement l'appareil représenté à la fig. 1, dans lequel les électrodes *a* et *b* ont la forme de tétons. L'axe

[336.187]

MÉTAL ET AUTRES QUE LE FER.

teur d , tandis que l'électrode supérieure b est montée sur une clipe x , qu'on peut faire tourner au moyen du levier à poignée t qui y est relié, autour de l'axe u , de telle façon que les pointes des électrodes a et b se rapprochent ou s'écartent l'une de l'autre. Si alors on amène, par exemple, deux extrémités de fer blanc qu'il s'agit de souder et qui se recouvrent réciproquement entre les électrodes et qu'on applique énergiquement celles-ci tout en produisant le circuit, il se forme un petit point rond de soudure très net qui remplace parfaitement un rivet. Dans ce cas également on peut régler d'une façon exacte, c'est-à-dire maintenir dans les limites voulues, surtout pour des récipients minces qui n'ont pas à subir une pression très forte, la pression exercée sur le point de soudure au moment voulu.

20

RESUME.

1° Un procédé pour la fabrication d'objets métalliques, surtout d'objets faits de feuilles métalliques extrêmement minces, par soudage électrique direct, caractérisé en ce qu'une électrode, ou les deux sont utilisées pour exercer avant ou pendant l'aménagement du cou-

rant électrique, ou seulement pendant l'admission du courant, une pression de pression exactement réglable sur le point où le soudage doit avoir lieu.

2° Deux électrodes en forme de galebs, tenons ou autres, entre lesquels on introduit les objets à souder (fers-blancs ou autres), dont l'une peut être rapprochée ou écartée de l'autre au moyen d'un levier, excentrique ou autre dispositif, actionné par une crémaillère ou autre dispositif.

3° Pour permettre un soudage continu de joints longitudinaux, transversaux et circulaires, deux électrodes en forme de gilet dont l'une ou les deux, maintenues sous une pression convenable, sont actionnées à la main ou au moyen de dispositifs mécaniques pour produire l'aménagement de la pièce qu'il s'agit de souder, tandis que celle-ci peut aussi être tirée à travers les électrodes à gilet, maintenues sous une pression convenable, une commande spéciale des électrodes à gilet étant alors inutile.

W. EGEL.

Par procuration :

E. BLÉRY.

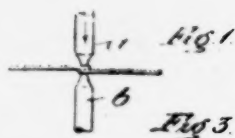


Fig. 2.

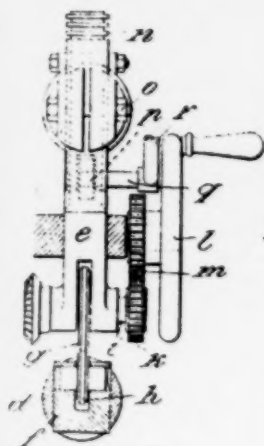


Fig. 3.

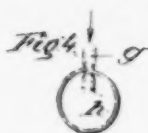
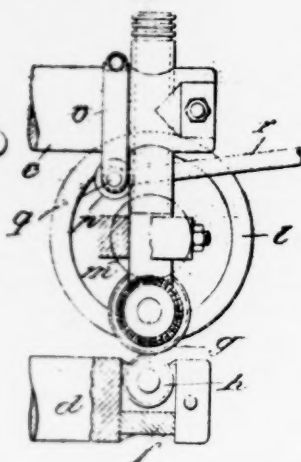
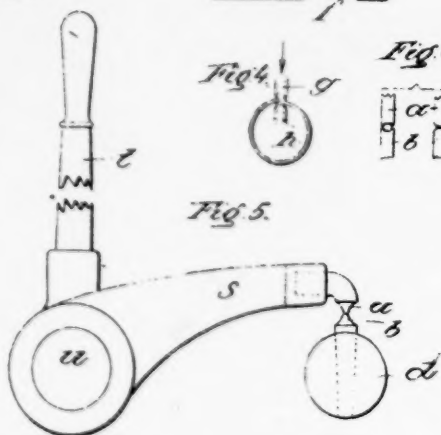


Fig. 5.





TRANSLATION.

FRENCH PATENT No. 336,187—WILHELM EGEL—
October 13, 1903

Process and Apparatus for the Manufacture of Metallic Objects of All Kinds, Principally Objects of Extremely Thin Sheets, by Direct Electric Welding.

(DELIVERED JANUARY 7, 1904; PUBLISHED MARCH 1, 1904.)

The present invention consists in a process for the manufacture of metallic objects of all kinds, principally objects of extreme thin sheets, by direct electric welding. The new process consists in that one of the electrodes, or else both, do not serve only for conducting the electric current, but are also used to exert, before and during the turning on of the electric current, or else only at the moment of such admission, a greater or less pressure at the point at which the welding is to take place. In consequence, the member which conducts the electricity, constitutes, at the same time, the mechanical element, in such a way that much more favorable working conditions are obtained, because in all ordinary processes of electric welding, it is necessary, as is well known, to immediately energetically hammer or compress the point of welding, brought to the desired temperature, in order to obtain a satisfactory weld.

However, in none of the processes of electric welding now known are the bodies to be welded pressed during the operation solidly together by one of the electrodes or by both, to assist in the welding. Heretofore, no compressing action was exerted, or else it took place at a certain distance from the point where the welding was being done, but not by means of the electrodes themselves compressing directly the point to be heated. In fact, up till now, there has never been exerted a pressure, at the time of electric welding, by means of electrodes arranged in the direct line of the current, immediately above or at the welding surface or welding point.

To execute this process, various means may be made use of, because the necessary pressure at the welding point may be effected by means of any auxiliary mechanical devices, capable of producing or of transmitting a pressure, for example, by means of a press, directly or through lever transmission. However, this work may be performed, also, simply by means of hand levers or by means of direct or indirect manual action.

In the drawing:

Fig. 1 represents the welding, performed according to the present process, of two sheets of equal thickness, in an intermittent manner or in spots.

Fig. 2 is a front elevation.

Fig. 3 is a side elevation of a continuous electric welding device

in which the pressure action is exerted by roller electrodes, in such a way that the different points of the joints, which are to be welded, are successively united with a minimum consumption of current.

Fig. 4 represents the welding of the longitudinal joint of a hollow cylindrical or conical object according to the new process.

Fig. 5 is a side elevation of a welding device, already indicated in Fig. 1, and in which there are used, to exert the pressure, electrodes of forms shaped to suit the particular requirements, and which may be adapted for as small contact surfaces as required.

Fig. 6 represents two practical forms of electrodes which touch at their ends.

As shown in Fig. 1, the two metallic objects (tin or the like) are introduced with their ends overlapping between the two electrodes *a b*. One of these electrodes is applied lightly before the welding, or else only during the welding, as is indicated by an arrow, on the other electrode, or else the two electrodes may exert together a pressure on the objects to be welded.

To execute the process, when it relates to a continuous welding action for longitudinal joints, cross joints or circular seams, there may be advantageously employed the means shown in Figs. 2 and 3 of the drawing.

In the two current conductors *c d* (Fig. 3) are inserted, in such a way as to make contact with said conductors, members in the form of forks *e f*, each of which is provided with a roller electrode *g* or *h*, readily interchangeable; however, only the lower electrode, for example, may be made removable. Likewise, the lower or upper electrode only may be in the form of a movable roller, while the other electrode constitutes the current conductor formed of a stationary element.

The roller *g* of the upper conductor *c* is keyed upon a shaft *i*, which is provided with a spur gear *k*, to which the movement of a hand-wheel *l* is transmitted by means of a pinion *m*; the hand-wheel may also be mounted directly, that is to say, without transmission, on the shaft *g*. Furthermore the shaft *i* may be provided on the other side with a spur gear, a bevel gear, a driving pulley, etc., which serves to mechanically actuate the roller electrode *g*, when an automatic feed of the objects to be welded by power is desired. The hand-wheel *l* is designed to accelerate or retard the rotary movement of the roller *g* as needed, or else, generally, to actuate the roller by hand. The retardation or the acceleration of the movement of the shaft *i* when the movement is produced mechanically, can naturally be produced by other mechanical means. The upper part of the fork which carries the electrode *g* is formed in this case as a rack *n*, in which meshes a pinion *p*, mounted by means of a collar *o* on the conductor *c*, and which is keyed on a shaft *q*, the outer end of which is provided with a hand-lever *f*. By raising or lowering the lever *r*, the upper roller electrode *g* may be brought nearer to or further away from the lower roller *h*. Fur-

thermore, by raising or lowering the fork *f* in the conductor *d*, the lower removable roller *h* can be raised or lowered.

Thus, if the edges of the material to be welded are brought between the two roller electrodes *g* and the circuit is closed, a continuous welding may be obtained in this manner, that is to say, an uninterrupted joint, while the upper roller electrode *g* may be applied as desired on the lower roller electrode *h* which is fixed, or else also movable, so that the two material edges to be welded are united in a solid manner.

Instead of bringing the objects to be welded successively between the electrodes, the apparatus may be arranged so that it can be moved relatively to the stationary objects to be welded.

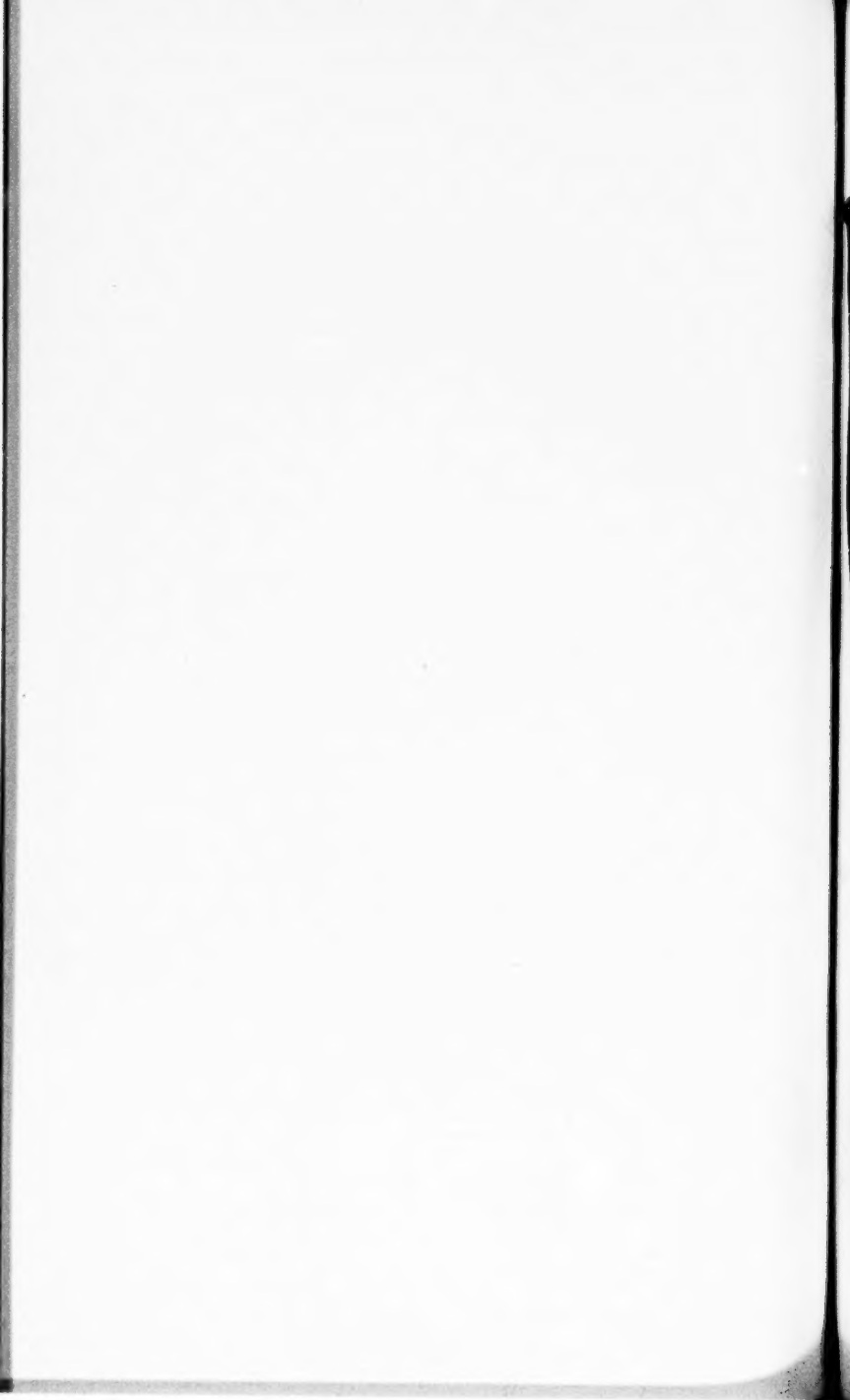
When it is required, for example, to weld sheets at certain points only, the apparatus represented in Fig. 4 (?5) may be advantageously employed, in which the electrodes *a* and *b* have the form of pins. The lower electrode *b* is inserted in the conductor *d*, while the upper electrode *a* is carried by an arm *s*, which can be turned by means of a hand-lever *t*, to which it is connected, around the shaft *u*, in such a way that the points of the electrodes *a* *b* are approached towards or separated from each other. If then, for example, two ends of sheet tin, which are to be welded and which overlap each other, are placed between the electrodes and the latter are firmly pressed together, while the circuit is closed, there is formed a small round point of weld, clearly defined, which takes the place of a rivet perfectly. In this case also, the pressure exerted on the point of weld at the desired moment can be controlled very exactly, that is to say, be maintained within the desired limits, especially for thin vessels which are not to be subjected to a very high pressure.

CLAIMS.

1. A process for the manufacture of metallic objects especially objects made of extremely thin metal sheets, by direct electric welding, characterized by the fact that one of the electrodes, or both of them, are utilized to exert, before or during the passage of the electric current, or else only during the admission of said current, a pressure preferably accurately controllable, at the point where the welding is to take place.

2. Two electrodes in the form of rollers, pins or the like, between which are introduced the objects (sheet tin or the like) to be welded, one of which electrodes may be approached towards or separated from the other by means of a lever, eccentric or other device, actuated by a rack or other means.

3. To permit a continuous welding of longitudinal, transverse and circular joints, two electrodes in the form of rollers, of which one or both, maintained under a suitable pressure, are actuated by hand or by means of mechanical means to produce the feed of the pieces to be welded, while the latter can also be drawn through the roller electrodes, maintained under suitable pressure, in which case a special control of the roller electrodes is unnecessary.



UNITED STATES OF AMERICA,

DEPARTMENT OF THE INTERIOR,

UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

THIS IS TO CERTIFY that the annexed is a photographic copy

from the Records of this Office of the Specification and Drawing,

in the matter of the

German Letters Patent to

Nikolas von Benardos,

Dated May 8, 1889.

Number 50,909.

for

Verfahren zur Bearbeitung von Metallen durch ertliche
Ertzung derselben mittelst Elektricitat.

IN TESTIMONY WHEREOF I have hereunto set my hand

and caused the seal of the Patent Office to be affixed

at the City of Washington, this 29th day

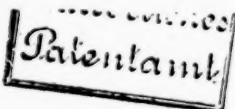
of November, in the year of our Lord one

thousand nine hundred and eighteen and of

the Independence of the United States of America the

one hundred and forty-third.

R. F. Whitehead
Acting Commissioner of Patents.



KAISERLICHES



PATENTAMT.

PATENTSCHRIFT

— № 50909 —

KLASSE 49: MECHANISCHE METALLBEARBEITUNG.

 AUSGEBESEN DEN 19. FEBRUAR 1893
 29 1893

NIKOLAS VON BENARDOS IN ST. PETERSBURG.

Verfahren zur Bearbeitung von Metallen durch örtliche Erhitzung derselben mittelst Elektrizität.

Patentirt im Deutschen Reiche vom 8. Mai 1889 ab.

Die Erfindung betrifft eine neue Anwendung des bekannten Joule'schen Gesetzes der Elektrizitätslehre. Die zu bearbeitenden Metalle, vorzugsweise Stücke von geringerem Abmessungen, werden mit einem feuerbeständigen, verhältnismäßig schlechten Leiter der Elektrizität (Graphit, präparierte Kohle, Gemenge von Thonerde mit Kohle, Magnesium, Iridium, Kohle mit dünnen Metallüberzügen) in Berührung gebracht, während dieser Leiter von einem so starken elektrischen Strom durchflossen wird, daß dieser Leiter diejenige Temperatur annimmt, welche für die beabsichtigte Bearbeitung der Metalle gerade erforderlich ist.

Es kann dieses Verfahren dazu dienen, verhältnismäßig dünne Bleche und Stäbe gleichartiger oder verschiedenartiger Metalle unmittelbar mit einander zu verschweißen, Metallverbindungen unter Anwendung eines Lothes auszuführen, metallene Gegenstände oder Theile derselben für den Zweck der Härtung auf eine bestimmte Temperatur zu bringen und gehärtete Gegenstände durch Erwärmung auf einen bestimmten Hitzegrad anzulassen.

Sowohl hinsichtlich des der Erfindung zu Grunde liegenden Gedankens, als hinsichtlich der Art der Anwendung unterscheidet sich dieses Verfahren wesentlich von dem von Benardos'schen Verfahren, die Metalle unter unmittelbarer Anwendung des elektrischen Lichtbogens zu bearbeiten, sowie von dem elektrischen Schweißverfahren von Elihu Thomson.

Zur Anwendung des im Vorstehenden charakterisirten Erfindungsgedankens dienen eine Anzahl einfacher Vorrichtungen, aus deren Be-

schreibung die Eigenthümlichkeiten der Erfindung noch besonders ersehen werden können.

Um zwei dünne Bleche mit einander zu verschweißen, werden dieselben durch ein biegsames Kabel mit dem einen Pol einer kräftigen Elektrizitätsquelle von geringem inneren Widerstand in leitende Verbindung gesetzt. Mit dem anderen Pol dieser Elektrizitätsquelle steht ein Löthkolben *K* (s. Fig. 1) in leitender Verbindung; dieser Löthkolben ist in der Hauptsache aus einem die Elektrizität sehr gut leitenden Metalle (Kupfer) hergestellt und trägt an seinem unteren Ende in einer passenden Fassung ein kleines Stück *w* des die Elektrizität schlecht leitenden, feuerbeständigen Materials; mit letzterem geschieht die Bearbeitung des Werkstückes.

Am anderen Ende ist der Körper des Löthkolbens mit einem Heft versehen, welches die Hand des Arbeiters gegen die Wirkungen der Wärme und der Elektrizität schützt.

Sowie der schlechte Leiter *w* die zu bearbeitenden Metallstücke *A, A'* berührt, wird der Stromkreis geschlossen und ein beträchtlicher Theil der elektrischen Energie der Stromquelle wird im schlechten Leiter *w* in Wärme umgesetzt; *w* beginnt alsbald zu glühen. Durch Ausschalten von Widerstand aus dem Stromkreise mit Hilfe eines Rheostaten *C*, Fig. 1, wird die Temperatur des Stückes *w* so lange gesteigert, bis das zu bearbeitende Metall zu schmelzen beginnt. Alsdann wird unter mäßigem Druck entweder der elektrische Löthkolben längs der herzustellenden Naht oder das zu bearbeitende Metallstück unter dem feststehenden Löthkolben fortbewegt.

die Arbeit beendet, so wird durch einen Ausschalter der Strom unterbrochen und hierauf der Lötkolben vom Metall entfernt.

Um den zu bearbeitenden Metallstücken eine sichere Unterlage zu gewähren, werden dieselben entweder auf eine feuerbeständige, die Wärme schlecht leitende Unterlage Asbest gelegt, oder ein derartiger schlechter Wärmeleiter wird durch eine geeignete Vorrichtung auf der anderen Seite gegen das Werkstück gepreßt. In gewissen Fällen kann es jedoch auch zweckmäßig erscheinen, durch Auflagerung der zu bearbeitenden Stücke auf eine die Wärme rasch abführende Unterlage, Metall, den Widerstand gegen den Druck des Lötkolbens herzustellen.

Bei manchen Arbeiten, für welche die vorliegende Erfindung zweckmäßig erscheint, wird es vorzuziehen sein, zwei sich gegenüberstehende Lötkolben zu verwenden, von welchen der eine mit dem positiven, der andere mit dem negativen Pol einer Elektrizitätsquelle verbunden ist, während die beiden Lötkolben von einander isoliert sind.

Fig. 2 zeigt im Grundriss-Aufsicht und Seitenansicht eine Vorrichtung, welche zur Ausübung des Verfahrens in dieser eben angedeuteten Weise geeignet erscheint. Zwei Lötkolben K' und K'' sind zu einer Art Schere oder Zange vereinigt, und sind beide um eine Achse C drehbar. Durch isolierende Zwischenschichten wird der Uebergang des Stromes von einem Lötkolben zum anderen durch die Achse C unmöglich gemacht. Die Klemmen D' bzw. D'' nehmen die Enden der mit den Polen der Elektrizitätsquelle verbundenen biegsamen Kabel auf. Der Strom geht alsdann von D' über K' nach w' , von dem aus schlecht leitendem, feuerbeständigem Material hergestellten Stücke w' durch das zu bearbeitende Metall nach w'' über und kehrt über K'' und D'' , durch einen Rheostaten hindurchgehend, zur Elektrizitätsquelle zurück. Die Holzhefte der beiden Lötkolben sind wiederum H' und H'' . F eine Feder, durch welche die beiden Stücke w' und w'' zusammengepreßt werden.

In Fig. 3 ist eine der in Fig. 2 dargestellten sehr ähnliche Vorrichtung abgebildet. Die beiden Lötkolben werden hier von einem Ständer getragen, von dem sie jedoch durch nicht leitende Zwischenschichten isoliert sind. D' und D'' sind wiederum die beiden Klemmen, welche die den Strom zu und abführenden Kabel aufnehmen. Der obere Lötkolben besitzt bei I ein Scharnier, und G ist ein verschiebbares Laufgewicht, durch welches der obere Lötkolben gegen den unteren ange- drückt wird. F' und F'' sind zwei Führungsrollen oder auch zwei Walzen, welche außer zur Führung zur Glättung der Lötnaht dienen.

In Fig. 4 ist eine einfache Vorrichtung abgebildet, welche dazu bestimmt ist, stabförmige Gegenstände Ende an Ende zu verschweißen. Zwei Ständer A' und A'' , welche durch die Klemmen D' und D'' mit den Polen der Elektrizitätsquelle verbunden sind, tragen oben zwei durch Scharniere bewegte Deckel B' und B'' . In diesen befinden sich Stücke schlecht leitenden, feuerbeständigen Materials w' und w'' , zwischen welchen der Strom von dem einen zum anderen Ständer übergeht. Diese Stücke schlecht leitenden Materials stehen zwar das eine mit dem Metall des einen Ständers, das andere mit dem Metall des anderen Ständers in leitender Verbindung; um denselben aber bei geringem Querschnitt eine angemessene Widerstandsfähigkeit zu geben, sind dieselben durch eine Schicht feuerbeständiger Chamotte- oder Specksteine in die Deckel B' und B'' eingepaßt. Die Stücke schlecht leitenden Materials besitzen eine dem Querschnitt des zu bearbeitenden Stückes angemessene Muth.

Laßt man einen elektrischen Strom in D' eintreten, so geht derselbe über A' , durch das schlecht leitende Stück w' , durch das Werkstück E nach w'' und von da nach A'' über und tritt durch D'' wieder aus. Die Stücke w' und w'' werden hierbei glühend und bewirken das Erhitzen des zu bearbeitenden Metallstückes E .

Fig. 5 stellt eine ähnliche Vorrichtung dar, dazu bestimmt, Drähte Ende an Ende zu verschweißen. Die zu verbindenden Drahtstücke werden zwischen die aus schlecht leitendem, feuerbeständigem Material hergestellten Backen von passender Form w' und w'' gebracht, durch welche, wie bei den vorher beschriebenen Einrichtungen, der Strom hindurchgeht. Bei E trägt dieser Apparat eine Feder, durch welche der obere Backen gegen den unteren gepreßt wird. Um den Verlust an Stromwärme durch Strahlung zu vermindern, ist der Haupttheil des Apparates von einem feuerbeständigen, isolirenden und schlecht Wärme leitenden Mantel M umgeben, der mit zwei Oeffnungen versehen ist, um dem Werkstück den Durchgang zu gestatten.

In Fig. 6 ist eine Einrichtung abgebildet, welche sich dadurch von den vorhergehenden unterscheidet, daß der Strom nicht durch das zu bearbeitende Metall selbst hindurchgeht. Der elektrische Lötkolben wird vielmehr dadurch hergestellt, daß der elektrische Strom in ähnlicher Weise ein Stück schlecht leitenden Materials durchfließt, wie den Faden einer Glühlampe, und dadurch das schlecht leitende Material zum Glühen bringt. In Fig. 6 sind zwei solche parallel geschaltete Lötkolben K' und K'' zu einer Lötzange vereinigt. Zwischen den beiden durch den Strom zum Glühen gebrachten Stücken schlecht leitenden Materials w' und w'' werden die zu bearbei-

enden Metallende von Hand oder durch zwei Leitrollen F und P hindurchgeführt. Diese Uebandlung hat den Vortheil, daß man die Zange öffnen bzw. das zu bearbeitende Metall von der Lötuvorrichtung entfernen kann, auch wenn der Strom nicht vorher unterbrochen wird, ohne daß ein elektrischer Lichtbogen oder elektrischer Funke zwischen Metall und Lötuvorrichtung gebildet wird.

PATENT-ANSPRÜCHE

- 1 Verfahren zur Bearbeitung von Metallen durch örtliche Erhitzung, welche man dadurch hervorruft, daß durch elektrische Stromwärme Körper, die aus schlecht leitendem Stoff Graphit, Kohle, Gemenge von feuerbeständigen, nicht leitenden und leitenden Massen hergestellt sind, glühend gemacht und mit diesen das zu bearbeitende Werkstück in Berührung gebracht wird.
- 2 Zur Ausführung des durch Anspruch 1 gekennzeichneten Verfahrens:

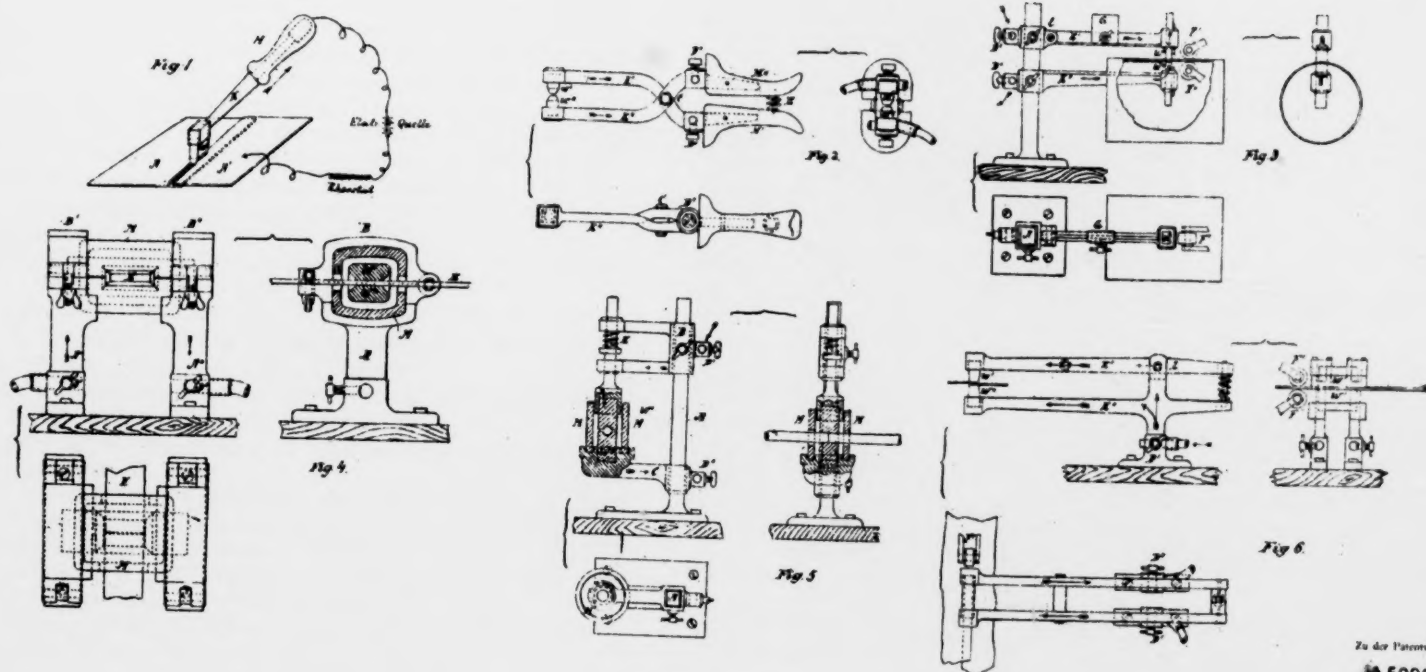
- a die in Fig. 1, 2, 3, 4 und 5 dargestellten Vorrichtungen, welche zur Verschweißung und Verlöthung gleichartiger oder verschiedenartiger Metalle oder zum Härten bzw. zum Anlassen von Körpern dienen können und dadurch gekennzeichnet sind, daß ein elektrischer Strom feuerbeständige, schlecht leitende Körper zum Glühen bringt, indem er durch diese und durch das zu bearbeitende Werkstück selbst hindurchgeht;
- b die in Fig. 6 abgebildete Erfindungsvorrichtung, welche darauf beruht, daß das zu bearbeitende Werkstück mit einem oder mehreren durch elektrischen Strom glühend gemachten, feuerbeständigen, schlecht leitenden Körpern in Berührung gebracht wird, ohne daß dabei dieser elektrische Strom durch das Werkstück selbst hindurchgeht.

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NIKOLAS VON BENARDOS IN ST. PETERSBURG.

Verfahren zur Bearbeitung von Metallen durch örtliche Erhitzung derselben mittelst Elektricität.



POSITIV. ZEICHN. VON BENARDOS.

Zu der Patentschrift
M 50909.

1152

Defendant's Exhibit No. 28.

TRANSLATION OF GERMAN PATENT NO. 50,909, NIKOLAS VON
BENARDOS.

Patented from May 8, 1889; Issued February 19, 1890.

Process of Working Metals by Heating Them Locally by
Electricity.

This invention relates to a novel application of the well known JOULE'S law of electrotechnics. The metals to be worked, preferably pieces of small dimensions, are brought into contact with refractory material which is also a relatively bad conductor of electricity, (for example, graphite, prepared carbon, mixture of clay with carbon, magnesium, iridium, carbon with thin metal coatings,) while said conductor is traversed by an electric current of such strength that it will heat said conductor to that temperature which is exactly required for the desired working of the metals.

This process may serve to directly weld together relatively thin metal sheets and rods, of one and the same or of different metals; to the joining of metals with the use of a solder; to heating metal objects or parts to a definite temperature for the purpose of hardening them, and to annealing hardened objects by heating them to a certain temperature.

This process is clearly distinguished, both from the point of view of the inventive idea on which it is based and from that of its mode of operation, from the prior Benardos process working metals by the direct employment of the electric arc, as well as from the electric welding process of Elihu Thomson.

In putting into practice the inventive idea stated above a variety of simple apparatus may be used, from the description of which the distinguishing characteristics of the invention will be more particularly understood.

To weld together two thin sheets, they are conductively connected by a flexible cable with one pole of a powerful source of electricity of low internal resistance. With the other pole of said source of electricity is conductively connected a welding tool (soldering iron) K, (see Fig. 1,) which is made principally of a metal (copper) which is a very good conductor of electricity, said tool carrying in a suitable holder at its lower end, a small block *w* of heat refractory material which is also a bad conductor of electricity; it is this block which performs the operations on the metal.

At its other end the body of the tool is provided with a handle of insulating material (wood) to protect the hand of the workman from the effects of the heat and electricity.

The bad conductor *w* being brought into contact with the pieces of work A', A'', the circuit is closed and a considerable portion of the electrical energy is converted into heat in the bad conductor *w*, which immediately begins to glow. By cutting resistance out of the circuit with the aid of a rheostat C, Fig. 1 the temperature of the block *w* is raised until the metal of the work-pieces begins to

melt. Then, while heavy pressure is applied, either the tool is moved along the joint or else the work is moved under the stationary tool. When the joint is welded, the circuit is interrupted by a circuit breaker and the tool is removed from the work.

To provide a safe backing for the work pieces, they are either laid upon a fireproof support which is a poor conductor of heat (asbestos), or else such a bad heat conductor is pressed against the work on the other side from the tool by any suitable mechanism. In certain cases, however, it may be of advantage to make the backing support of the work which resists the pressure of the tool, of material (metal) which conveys heat away rapidly.

For some kinds of work to which the present invention is applicable, it may be advantageous to employ two opposed welding tools, one of which is connected to the positive pole, and the other to the negative pole of a source of electricity, the two tools being insulated from each other.

Fig. 2 shows, in plan, elevation and end view, an apparatus designed to carry out the process in the manner just described. Two welding tools K', K'', are united in the manner of a pair of shears or tongs, both being oscillatably mounted on the pivot C. The current is prevented from passing from one tool to the other through the said pivot by the interruption of insulating material. Binding screws D', D'', receive the ends of the flexible cables connected to the poles of the source of electricity. The current thus flows from D' through K' to ω' , from this block of refractory and poorly conducting material through the metal of the work to block ω'' , and returns through K'' and D'' and through a rheostat to the source of electricity. H' and H'' are the wooden handles, and E is a spring by which the two blocks ω' and ω'' are pressed together.

Fig. 3 represents an apparatus which is very similar to that shown in Fig. 2. The two tools are here mounted on a standard from which they are insulated by suitable material. D' and D'' are here again the binding screws to which the current conductors are connected. The upper tool is hinged at I and G is a sliding weight by which the upper tool is pressed against the lower one. F', F'' are two feed rollers, or else rolls which serve to smooth the joint as well as to feed and guide the work.

Fig. 4 illustrates a simple apparatus designed for welding rod-shaped objects end to end. Two standards A', A'', which are connected by binding screws D', D'', with the poles of the source of electricity, carry at their top two hinged covers B', B'', containing blocks ω' , ω'' of heat refractory material which is a poor conductor of electricity, between which the current flows from one standard to the other. These blocks of poorly conductive material are in connection, one with the metal of the one standard and the other with the metal of the other standard; in order to give them sufficient resistance when of small section, they are enclosed in jackets of refractory firebrick or soapstone in the covers B', B''. The blocks of poorly conductive material are grooved to fit the work.

When an electric current enters at D', it flows through A', poorly conductive block w' and the work E' to block w'' , thence through A'' and out at D''; the blocks w' , w'' are thereby caused to glow and cause the heating of the metal piece E to be treated.

Fig. 5 shows a similar apparatus designed for butt welding wires; The wires to be joined are placed between the jaws w' , w'' of heat-refractory and poorly conductive material and of suitable shape; the current flows through them as before. This apparatus comprises a spring E by which the upper jaw is pressed against the lower. To reduce the loss of heat by radiation, the main part of the apparatus is enclosed by a jacket M, of refractory, insulating and non-conducting material, the jacket having suitable openings for the work to pass through.

Fig. 6 illustrates an apparatus which is distinguished from those hereinbefore described in that the current does not pass through the work itself. The electric tools are so constructed that the current flows through and heats up a block of poorly conductive material, as it does in the case of electric lamp filaments, and thus raises the poorly conductive material to a glowing heat. In Fig. 6, two pairs of such tools K' and K'' are parallelly mounted and combined in a welding tongs. Between the two poorly conductive blocks w' , w'' , heated by the current to incandescence, the work is fed by hand or by rollers F', F''. This form of apparatus has the advantage that the tongs can be opened and the work removed without the circuit having been opened, for no electric arc or spark will be formed between the work and the tools.

CLAIMS.

1. Process of working metals by local heating, the heat being generated by raising to incandescence, by the passage of an electric current, blocks of poorly conductive material (graphite, carbon, mixtures of fireproof, non-conducting and conducting substances), and bringing the piece to be worked into contact with said blocks.

2. To carry out the process defined in claim 1: (a) The apparatus represented in Figs. 1, 2, 3, 4 and 5, which can serve for welding and soldering the same or different kinds of metal, or for hardening or annealing objects, and which are characterized by the fact that an electric current raises to incandescence fireproof, poorly conductive bodies, by flowing through the same and through the work-piece to be treated itself.

(b) The inventive apparatus represented in Fig. 6, which is based on the arrangement whereby the work-piece to be treated is brought into contact with one or more fireproof, poorly conductive bodies, raised to incandescence by an electric current, without that said electric current flows through the work-piece itself.



COPY OF
ORIGINAL APPLICATION
OF
JOHANN HARMATTA
FOR
IMPROVEMENTS IN ELECTRIC
WELDING
FILED DECEMBER 3, 1903

PETITION and POWER

To the Commissioner of Patents,

UNITED STATES of AMERICA.

Your Petitioner Johann Harmatta Engineer, a subject of the King of Hungary residing at Szepesvaralja, in the Kingdom of Hungary prays that Letters Patent of the United States be granted to him for the Improvements in Electric Welding set forth in the annexed specification:

And he hereby appoints Messrs Marion and Marion (J. A. Marion & J. Wilfrid Marion) of Montreal, Province of Quebec, Canada, and Washington, D.C., U.S.A., his Attorney with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to sign his name to the drawings, to receive the Letters Patent when issued, and to transact all business in the Patent Office connected therewith.

Signed at Budapest, Hungary this 5th day of November, 1903

Johann Harmatta

Address communications to

MONTREAL OFFICE

Specification.

To all whom it may concern:

Be it known that I, J o h a n n H a r m a t t a, Engineer, a subject of the King of Hungary, residing at S z e p e s v a r a l j a, in the Kingdom of Hungary, have invented new and useful "Improvements in Electric Welding", of which the following is a specification.

My invention relates to a process of and apparatus for manufacturing metal articles of all kinds, in particular those of the thinnest sheet metal, by direct electric welding. The new process consists in one of the electrodes (or both of them) not only serving to feed the current, but also being employed for exercising a more or less strong pressure either before and during the period of supplying the electric current, or only at the moment of this supply, at the place at which the welding is to be done. The member which feeds the electricity is thus at the same time the tool, and in this manner the most favorable con-

ditions of working possible are secured, since, as is well known, in really effective welding processes the place of welding brought to the proper temperature must be at once well hammered or pressed in order that the welding may be thorough.

According to none of the present known electric welding processes are the articles to be welded firmly pressed together during the welding operation by one or both electrodes, for the purpose of favoring welding. Hitherto either no pressure has been exerted at all, or it has been exercised at a certain distance from the place of welding, or at all events not centrally direct upon the electrodes pressing on the place to be heated. In short, hitherto direct electric welding pressure has never been exercised by means of the electrodes located in the direction of the current directly above the surface or point being welded.

For carrying out the new process various apparatus may be employed, as the necessary pressure may be exerted at the place of welding by the aid of any of those technical means which are suitable for producing or transmitting pressure; e. g., with a press either direct or by means of indirect transmission by levers. Or it may be by means of simple hand levers, that is to say, by means of direct or indirect manual power.

In the accompanying drawing

Fig. 1 is a view illustrating the welding of

two metal sheets of equal thickness, intermittently or at certain spots only.

Fig. 2 is a front elevation and

Fig. 3 a side elevation of a device which may be employed for continuous welding, the pressure being exerted by roller electrodes, whereby the advancing series of single points of the seam to be welded is united to a whole with a minimum consumption of current.

Fig. 4 illustrates the method of welding the longitudinal seam of a cylindrical or conical hollow article according to my new process.

Fig. 5 is a side elevation of a welding device (also illustrated in part in Fig. 1) according to which the pressure is exercised by pin shaped electrodes, the form of which may be suited to the particular purpose in view, and which may be adapted to work on the smallest possible surface of contact.

Fig. 6 shows two forms which may be adopted for the ends of the contacting electrodes.

As Fig. 1 shows, the two sheet metal or other bodies, the edges of which lie upon each other, are introduced between the two electrodes *a b*. Of the latter the one, somewhat prior to welding or only during the welding operation, is pressed upon the other, as the arrow shows; or both electrodes may be caused to exert pressure on the objects to be welded.

For continuous welding of longitudinal, cross and circular seams, the device shown in Figs. 2 and 3 of the drawing may be advantageously employed.

In the two conductors *c d* (Fig. 3), forked members *e f*, making intimate contact with the conductors, are introduced, each furnished with a removable roller electrode *g* and *h*; or, if desired, only the lower roller electrode, for instance, may be capable of being removed. Or the lower or upper electrode may be formed as movable roller and the other electrode forms a stationary conductor.

The roller *g* of the upper conductor *c* is keyed to an axis *i* carrying a spur wheel *k* to which the motion of a suitably mounted hand-wheel *l* can be transmitted by means of a spur wheel *m*. Or the hand-wheel may be mounted directly on the shaft *g*, without the use of any intermediate gear-wheels. Or the axis *i* may have on the other end also a spur or bevel wheel, or pulley or the like for driving the roller electrode *g*, should it be desired to automatically advance the object being welded by means of motor power. The purpose of the hand-wheel is to accelerate or decrease the speed of rotation of the roller *g*, as may be required, and in general to actuate the roller by hand for any purpose. The axis *i* may, of course, be caused to move slowly or faster in the case of mechanical power, by any other suitable means. The

1161
upper part of the fork carrying the electrode roller *g* is here shown as constituting a toothed rack *n*, in which engages a pinion *p* carried by the conductor *c* by means of a ring-holder *o*. The pinion *p* is keyed to the axis *g*, which carries a hand lever *r* at its outer end. By raising or depressing the lever *r*, the upper roller electrode *g* may be separated from or advanced towards the lower roller electrode *h*. Furthermore by raising or depressing the forked piece *f* in the conductor *d* the lower removable roller *h* may be adjusted higher or lower.

If now the ends of the objects to be welded are introduced between the two roller electrodes *g h* and the circuit closed, continuous welding may be undertaken, that is to say an uninterrupted welded seam made, whereby the upper rotary roller electrode *g* may be pressed with any required degree of pressure upon the lower stationary (or rotary) roller electrode *h*, so that the two ends of the material to be welded are firmly connected with each other.

Instead of the objects to be welded being introduced gradually between the electrodes. the electric welding apparatus may be arranged to slide relatively to the stationary objects.

Thus if it is required to weld, for instance, sheets of metal only at particular places, the apparatus shown in Fig. 5 may be advantageously employed,

2 words interline-
ated

the electrodes *a b* having the form of pins. The lower electrode *b* is then inserted in the conductor *d*,

whilst the upper electrode *a* is carried by an arm *s* by means of a hand-lever *t* carried by said arm *s* and can be turned on the shaft *u* in such manner that the points of the electrodes *a b* approach and recede from each other. If then two superposed sheet metal ends to be welded together are introduced between the electrodes, and the latter then firmly pressed together and the circuit closed, a small round, very sharply defined place of welding is caused which perfectly answers the purposes of a rivet. In this event, also, especially in the case of thin vessels which are not required to withstand great pressure, the pressure on the place of welding may act at the right moment be exactly regulated or kept within the proper limits.

Having thus described my invention, what I claim as new and desire to secure by letters patent is:—

1. The process of electric welding, consisting in employing the electrodes not only to conduct the current to the objects being welded, but also to exert a regulable pressure on the same, substantially as described.

2. An electrode apparatus for electric welding, comprising two electrodes between which the objects to be welded are introduced, and means whereby one of the

electrodes can be approached to and receded from the other, substantially as described.

3. An electrode apparatus for electric welding comprising two roller electrodes between which the objects to be welded are introduced, and means for pressing the electrodes to the work, substantially as described.

4. An electrode apparatus for electric welding, comprising two roller electrodes between which the objects to be welded are introduced, means for pressing the electrodes to the work, and means for rotating one or both of the rollers for the purpose of advancing the work in its path between the electrodes, substantially as described.

In Witness whereof I have hereunto signed my name this 5th day of November, 1903, in the presence of two subscribing witnesses,

Johann Harmatta

Witnesses:

Carl Becker

F. LaGuardia

A f f i r m a t i o n.

UNITED STATES CONSULATE;
BUDAPEST, HUNGARY.

Johann Harmatta, the above named petitioner being duly affirmed, deposes and says that he is a subject of the King of Hungary, and resident of Szepesvarálja, in the Kingdom of Hungary, and that he verily believes himself to be the original, first and sole inventor of the Improvements in Electric Welding, described and claimed in the annexed specification; that he does not know and does not believe that the same was ever known or used before his invention or discovery thereof; or patented, or described in any printed publication in any country before his invention or discovery thereof, or more than two years prior to this application;

or patented in any country foreign to the United States on an application filed more than twelve months before this application; or in public use, or on sale in the United States for more than two years prior to this application, and that no application for patent for said improvement has been filed by himself or his legal representatives or assigns, in any country foreign to the United States, except as follows: Germany, March 24th, 1903; Sweden, October 12th, 1903; France, October 13th, 1903; Austria, October 14th, 1903; Denmark, October 14th, 1903; Hungary, Oct. 15th, 1903; Switzerland, October 16th, 1903; Belgium, October 16th, 1903.

Johann Harmatta.

Affirmed to and subscribed before me this fifth day of November 1903.

Frank Dyer Chester

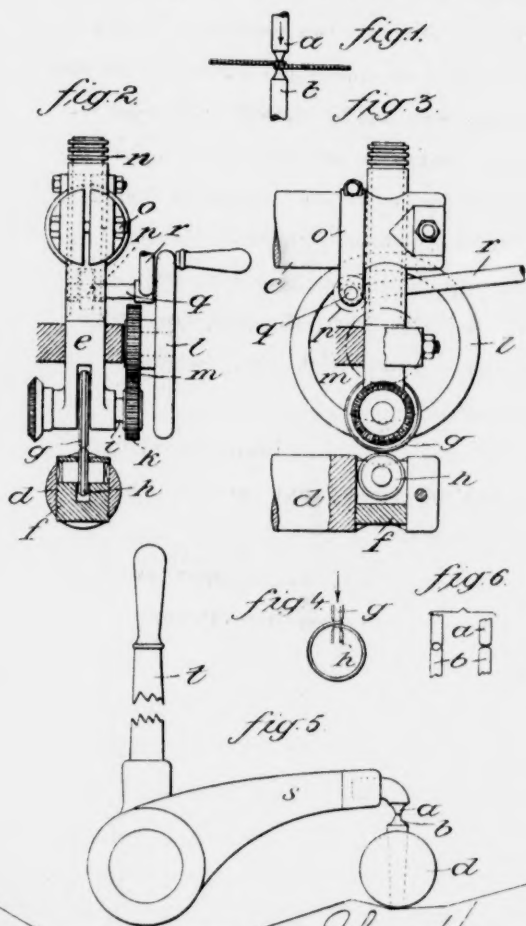
United States Consul.

SEAL

N.S. 360

1903.

Granted for Pat Drg May 14, 1904



Witnesses:
J. Myrard
M. M. Acker

Johann Harmsatta
 Inventor
by Marion Marion
 Attorneys

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

THIS IS TO CERTIFY that the annexed is a true copy from the
Records of this Office of the File Wrapper, Contents and all
Drawings of the matter of the

Letters Patent of

Sebastian Ziani de Ferranti,

Number 1,221,

Granted July 27, 1915,

for

Improvement in Processes for Electrically Welding Turbine-Blades.

IN TESTIMONY WHEREOF I have hereunto set my hand
and caused the seal of the Patent Office to be affixed
at the City of Washington, this 6th day
of December, in the year of our Lord one
thousand nine hundred and seventeen and of
the Independence of the United States of America the
one hundred and forty-second.

JWH-clg
Acting Commissioner of Patents.

NUMBER (SERIES OF 1900).

208,034

1904

DIV. 39 13 3

PATENT No. 1148221

(EX'R'S BOOK). 4-4
10/92 - G (1905 Book)

Name Sebastian Ziani de Ferranti

of Hampstead, London

County of

State of- England

Invention Process and Apparatus for Electrically Welding Turbine
Blades to their Carrying Elements

ORIGINAL.

RENEWED.

Division of App., No.
PARTS OF APPLICATION FILED.

Petition May 14 , 1904 , 190

Affidavit " " , 1904 , 190

Specification " " , 1904 , 190

Drawing 12 apts " " , 1904 , 190

9 sheets canceled Sept. 27, 1904 / 1 sheet canceled

1 sheet Dec 30 1912 (10 Dec 29-1914 , 190

Model or Specimen 190

First Fee Cash \$15, May 14 , 1904 , 190

" " Cert. , 190 , 190

Appl. filed complete May 14 , 1904 , 190

Examined by J. Rich for Dec. 29 , 1904. , 190

Countersigned W W Mortimer , 190

For Commissioner.

Notice of Allowance Dec. 31 , 1904 , 190

Final Fee Cash \$20 June 30 , 1905 , 190

" " Cert. , 190 , 190

Patented July 27 , 1905 , 1905

Associate Attorney

Attorney Spear, Middleton
Donaldson & Spear

City

Name

Serial Number

Patent No.

Date of Patent

208,034

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CHIEF CLERK U.S.PATENT OFFICE

U.S.PATENT OFFICE,
RECEIVED
JAN 9 1905
DIVISION No.13

1169
~~REV. 37~~ PAPER NO.
1/2

208,034.
Application

APPLICATION FOR UNITED STATES PATENT.

PETITION WITH POWER OF ATTORNEY.

To the Commissioner of Patents:

Your petitioner Sebastian Ziani de Ferranti, a subject of the King of Great Britain and Ireland, residing at 31, Lyndhurst Road, Hampstead, London. N.W., England, whose Post Office address is 31, Lyndhurst Road, Hampstead, London, N.W. England, prays that Letters Patent may be granted to him for Process ~~and Apparatus~~ for Electrically Welding Turbine Blades to their Carrying Elements set forth in the annexed specification; and he hereby appoints Messrs. Spear, (Ellis Spear, Walter Donaldson, F.L. Middleton J.M. Spear) Middleton, Donaldson & Spear, of 1003, F. Street, N.W. Washington, D. C., United States of America, his attorneys with full power of substitution and revocation, to prosecute this application, make alterations and amendments therein, to receive the Patent, and to transact all business in the Patent Office connected therewith.

Sebastian Ziani de Ferranti

TO ALL WHOM IT MAY CONCERN:

BE IT KNOWN THAT I, Sebastian Ziani de Ferranti,

a subject of the King of Great Britain and Ireland,
and residing at 31, Lyndhurst Road, Hampstead, London

Apr. 30-09

Oct. 10, 1905

per P

N.W., England, have invented/certain new and useful
~~Bladed turbine element and process for the manufacture thereof,~~
~~Process and Apparatus for Electrically Welding Tur-~~
~~Process for Electrically Welding Turbine Blades~~
~~the blades to their carrying elements~~ of which

the following is a specification:

The invention relates to the electrical welding of turbine blades on to the wheels, rings or drums carrying them and has for its object to overcome the difficulties which have been experienced in electrically welding together two such parts differing considerably as regards their power of rising to the required welding temperature when heated at the point of junction, so that blade carrying elements with welded blades may be reliably produced in an inexpensive manner.

The main difficulty arises through the blades and their carriers differing as regards their power of conducting heat away from the welding point.

In the welding of a turbine blade to the carrier to which it is to be secured, it is found that the comparatively large volume of metal forming the carrier, rapidly conducts heat away from the welding point thus preventing the temperature of the carrier rising to the required extent and causing an unsatisfactory weld.

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pt. 27, 1904 The ~~first part of the invention~~, therefore, consists broadly in adjusting the volume of the blade carrying element in the neighbourhood of the welding point so that approximately equal heating occurs in both faces to be welded.

eled
pt. 27, 1904 The ~~second part of the invention~~ consists in a machine whereby the methods forming the first part of the invention can be carried into effect with great rapidity and accuracy.

rt A 1
pt. 27, 1904 Referring to the accompanying drawings, ^{such}
t. 27, 1904 Figure 1 is a part side elevation of a turbine wheel having cross grooves,

Figure 1a_ being an edge view;

Figure 2 shows a similar edge view of a modification in which sets of intersecting grooves are adopted;

Figure 3 shows an edge view of a form having circumferential grooves,

Figure 3a_ being a section on the line A A of figure 3;

Figure 4 shows, in a longitudinal sectional elevation, part of a drum carrier to which the blades are welded in accordance with one form of the invention;

Figures. 5 and 6 show edge views of modifications in which holes are bored radially into the edge of the disc, while

Figure 7 is a part side elevation in which holes are bored through from face to face of the disc;

Figure 8 shows a sectional plan of a form of wheel built up of two dished discs, held apart at their circumferential portions by distance pieces, partial

Figure 8a_ being a ~~scrap~~ ^{partial} edge view to a larger scale;

Figure 9 is a similar sectional plan of a modified

form of wheel built up of three discs, while

per I

Figure 9a is a corresponding ^{partial}~~scrap~~ edge view also to a larger scale;

Figure 10 shows a part sectional elevation of a wheel built up of two comparatively thick discs having notched edges,

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Figure 10a being a ^{partial}~~scrap~~ edge view, while

Figure 11 shows an edge view of a form of wheel and

" Insert H1

built up of a series of "stepped" laminae.

(It will be seen that all the edge views in the preceding figures are shown as developments for clearness of drawing and not as true projections.)

Figures 12 and 13 show a side elevation and plan respectively of the greater portion of the machine;

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Figure 14 is an end view partly in section, as seen from the right in figure 12,

Figure 15 showing an end view of the welding head but as seen from the left in figure 12;

Figure 16 shows an elevation of the slotting attachment supposed removed in figure 12;

Figures 17 and 18 show sectional elevation and plan respectively of the automatic stopping gear;

Figures 19 and 20 show side and views respectively of a form of blade holder having a mechanical clamping device.

Figures 21 and 22 being similar but with the clamping device operated electromagnetically.

The same reference symbols are, when possible, used in the accompanying drawings to denote similar parts.

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In carrying out the ~~first part of the~~ invention according to the form shown in figures 1 and 1a, the turbine wheel or disc is shown at a, cross grooves, b,

being cut in its circumferential edge so as to leave projecting portions of metal, g, to which the turbine blades, d, are welded.

The same object is attained by cutting two intersecting sets of grooves, g, in the edge of the disc, as shown in figure 2, or by cutting circumferential grooves, such as f, completely around the edge (see figures 3 and 3a.)

Figure 4 shows the invention according to one form applied to the case of a drum blade carrier, a'; the drum is grooved circumferentially with grooves, f', the intervening collars of metal being then cross-cut to form projecting teeth, g', on which the blades are welded.

According to a modified form, radial holes, h, may be bored a short distance into the edge of the disc, these holes being either arranged in patterns so as to leave intervening projections of untouched metal to which the blades may be welded as shown in figure 5, or arranged without particular reference to the position of the blades, (see figure 6).

In figure 7, a method is shown of removing metal in the neighbourhood of the welding point by boring holes, i, through (or partly through) from face to face of the disc at a radius slightly less than that of its outside edge.

The object to be kept in mind in this as in other modifications, is to remove sufficient metal to enable the temperature to rise to the welding point as explained above, whilst at the same time leaving sufficient areas untouched to ensure the mechanical strength in the welded joint.

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Referring now to figures 8 and 8a, a form of wheel is shown somewhat diagrammatically which is built up of two dished discs, k, of comparatively thin metal, held apart at their circumferential portions by one or more distance pieces such as l, disposed at a radius somewhat less than the maximum radius of the discs, the blades, d, being welded in position on their outside edges.

Figures 9 and 9a show a type of wheel generally similar to that last described but having an intermediate plane disc, m, in addition to the two dished discs, k; a portion, n, of the hub, o, is in this case made detachable so as to allow the different parts of the wheel to be assembled. Distance pieces, l, are indicated as before but any other convenient method of holding the discs in their correct relative position may be adopted.

Insert H 2

In figures 8 and 9, the dished discs, k, are indicated as secured to the hubs, o, by pressing the inner edges of these discs into grooves and subsequently burring over the hubs to hold the discs in place.

In the modification shown in figures 10 and 10a, two dished discs, k, are again employed but of thicker metal, their circumferential portions being brought into contact and cross grooves, h, being cut in their edges in accordance with the method described above with reference to figures 1 and 1a. Again, that portion of the disc carrying the blades may be built up of a set of thin laminae, r (see figure 11) the edges of which are notched as at s, the laminae being assembled in such a way that the notches, s, are "stepped" with regard to each other, so that the intervening projections of metal may follow the shape

of the turbine blades to be welded to them.

Instead of notching the laminae, they may be prepared in accordance with other of the methods pointed out above, before being assembled in the manner indicated.

pt. 27, 1904. In the first part of the invention, ^{an such as the present} it is not practicable to describe every method of carrying its broad underlying principle into effect, but the scope is sufficiently indicated by the many examples given above and moreover it will be evident without further description, how the invention may be applied to the welding together of turbine blades and carriers of other forms than those described above by way of exam-

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In carrying the second part of the invention into effect according to one form as shown in the drawings applied to the welding of blades upon a turbine wheel, i, the blade to be welded is held between renewable copper jaws, u, between which it is inserted so as to abut against a suitable stop, v, these jaws being of suitable shape fixed by screws to the copper jaw holder, w. Details of the jaw holder together with methods of clamping the blades are hereinafter described with reference to figures ^{19 22} ~~19 22~~. The shank or end of the jaw holder remote from the blade is made cylindrical and clamped in a cylindrical bearing having a copper cap, x, suitable connected to one pole of transformed ^r battery or the like. The jaw holder may be clamped in its cylindrical bearing in any position to suit the setting angle of the blades, a wedge such as z, of the necessary taper, being preferably inserted between the jaws holder, w, and a planed surface on the cross-head, 2, carrying the

cylindrical bearing, thus ensuring the correct angle and safeguarding against its alteration.

The crosshead, 2, works in a slide, 3, and is held in position by slide bars, 4; the lower face of the slide is inclined and co-operates with a corresponding inclined face formed on the welding head casting, 5, thus providing means for giving a delicate vertical adjustment to the crosshead. Studs or the like passing through slots in the welding head and nuts, 6, are provided for clamping the slide in place.

The pressure at the weld is obtained by means of an adjustable spring, 7, acting through a toggle, formed by the double link, 8, on the crosshead 2, and one leg, 9, of a bell crank pivoted on the welding head, 5. A rod, 10, connected to the toggle centre serves to transmit the pressure of the spring, 7, an adjustable stop, 11, being provided to limit the downward movement of the toggle centre. The rod, 10, passes through the spring, 7, and is provided at its upper end with a slot through which passes the tail end of a catch lever, 12, pivoted on the welding head; the pressure of the spring is transmitted to the catch lever through an adjustable set-screw, 13, projecting into the slot. This method obviates any side pressure and consequently friction on the toggle-rod.

The automatic switch, which is of the oil break pattern, is operated from a pair of levers, 14, pivoted on the welding head, by means of the spindle, 15.

A downward pull on the outer end of this double lever, 14, forces the switch on to its contacts against the pressure of a strong spring, 16, and also straightens out the links, 17, above, so that a catch piece, 18, fastened to one of these links, moves under and is

caught by the end of the catch lever, 12, thus retaining the switch in the "on" position. The switch is pulled on automatically as the welding head (operated in a manner to be described) reaches the back end of its stroke, by a bell crank lever, 19, one leg of which comes in contact with a fixed adjustable stop, 20, while the other is linked to the ^upper end of the double lever, 14, by means of the rod, 21.

The switch (see also figure 14, in which the rod, 21, is removed and the oil well wall partly broken away) is insulated from the levers, 14, by means of the fibre block, 22, forming part of the switch spindle 15, which is carried down into the oil well, 23, conveniently cast in one with the welding head. Two sets of contacts are provided, the upper or primary, 24, being preferably formed of laminated strips of copper; the lower or secondary contacts, 25, are arranged to make contact first and break last, this action being ensured by means of the light spring, 26. The break of the secondary contacts takes place in oil, thus preventing any arcing at the primary contacts. The main contact blocks, 27, to which the leads are connected, and the secondary contacts, 28, are mounted on an insulating ebonite base, 29.

To free itself from a blade that has just been welded, so that the turbine wheel ^{or} ring may rotate into position for the next weld, the welding head, 5, travel back in a slide formed in the box casting, 30, which is insulated from the main frame, 31, of the machine, in relation to which it is adjustable by means of studs and slots, adjusting screws or the like means, so that it can be secured in any position to suit different sizes of turbine wheels and lengths

of blades. Slide bars, 32, (see figure 15) constrain the motion of the welding head. This motion of the welding head is taken from a worm, 33, and worm wheel, 34, a sprocket wheel, 35, mounted on the worm wheel shaft, and chain, 36, serving to transmit the motion to a second sprocket wheel, 37, which together with a crank, 38, is mounted on the spindle, 39, this crank being linked to the welding head by means of the connecting rod or pitman, 40. The position of the bracket, 41, carrying the worm wheel, 34, and an sprocket wheel, 35, can be adjusted to correspond with that of the box casting, 30. The worm, 33, is driven through a feather by the shaft, 42, the motion of which is so controlled (in a manner to be hereinafter described) as to cause the crank, 38, to make half revolutions alternately backwards and forwards, at the end of each of which the shaft, 42, stops automatically. The sprocket wheel, 37, is insulated from the welding head by means of the fibre ring, 43, seen in figure 15.

Spring buffers, 44, are provided at the left hand end (as seen in figure 12) of the box casting, 30, to take up all back lash in the various joints and ensure a steady pressure at the welding point.

As the welding head approaches the back of its stroke, the switch is closed automatically as mentioned above and the rod, 45, pivoted to the end of the leg, 46, of the toggle bell crank, strikes against the fixed adjustable stop, 47, and causes the toggle centre to rise, thus drawing the blade holder backwards. The leg, 46, of the toggle bell crank is then caught and held by the trip lever, 48, pivoted on the welding head. This lever, 48, is tripped by the crank at both ends of the stroke but at the back end

it is arranged that the toggle bell crank shall be held by the rod, 45, and stop, 47, till after the crank is clear, so that the welding head moves forward with the trip lever, 48, in gear.

The full cycle of operations is thus as follows:-

The blade to be welded, having been placed in the jaws, H, with the welding head in its backward position, the shaft, 42, is started with the switch in the "on" position and both the trip or catch levers, 48 and 12, in gear. The shaft, 42, is stopped automatically (in a manner to be explained) as the blade reaches the turbine wheel and at the same time, the crank, 38, trips the lever, 48, thus freeing the toggle bell crank and allowing the spring, 7, to produce pressure on the weld. The electric current may be controlled by an independent switch under the control of the attendant or this switch may be kept closed during the whole operation, in which latter case the welding starts simultaneously with the tripping of the trip lever, 48. As the blade softens under the heat, the pressure of the spring, 7, causes a slight shortening of the blade, this shortening being greatly magnified by the toggle and causing a comparatively large movement of the rod, 10, which descends and trips the catch lever, 12, thereby leaving the spring, 16, free to act to open the switch. The shaft, 42, is then reversed and the welding head returned to the back end of its stroke, where it is again stopped automatically after switching on the current and setting the trip lever, 48. The adjustable stops, 11 and 13, enable the machine to be set to break contact at the exact time when the shortening of the blade corresponds to a satisfactory weld.

In addition to carrying out the operations described above, an automatically operated attachment is preferably provided whereby the wheel or disc is prepared by slotting, drilling and the like in advance of the weld as regards position on the wheel and without slackening the progress of the welding operation, the machine thus taking a plain wheel or disc and doing all that is necessary to it until it appears as a finished article with all the blades welded on.

If the turbine wheel, 1, is to be prepared by slotting, for example, the slotting head, 49, (see figure 16 where the slotting attachment is shown removed from the machine) is constrained to move in a casing or frame, 40, forming a vertical slide and having a slotted flange, 51, at the base, by means of which it can be adjusted tangentially and bolted to the bed or frame, 51, of the machine; a slot in this frame also enabled it to be adjusted longitudinally within the limits of the machine, so as to suit different sizes of turbine wheels. The cutting is done by one or more serrated cutters, 52, carried by the slotting head, the serrations being arranged in steps so that each tooth cuts deeper than the preceding one. In figure 13, two such cutters are indicated, the one being arranged in advance of the other as regards depth of cut. The slotting head is reciprocated by means of an internal screw, 53, engaging with a square nut, 54, fitting in a corresponding recess in the slotting head, 49, the screw, 53, being driven off the main motion shaft, 42, through bevel wheels, 55, one of which is slidably mounted on the shaft, 42, and is driven by a feather, the bracket, 56, which holds this wheel in position being adjustable long-

itudinally to correspond with different positions of the gearing. A clamp, 57, is provided to prevent the wheel vibrating as the cut is taken, this latter operation taking place as the welding head moves forward. After a new blade is welded in place, the motion of the shaft, 42, is reversed, thus causing the welding head to return and withdrawing the serrated cutters through the slots they have just formed. It is not until the cutters are well clear of the turbine wheel, that is to say, not until the welding head is toward the back end of its stroke that the automatic gear is operated to turn the wheel into position for the next weld.

This operation is effected by a rod, 58, passing through a hole in the welding head casting and having adjustable stops, 59, fixed to it. The rod actuates a crank, 60 fixed to it carrying a spring pressed pawl, 61, which co-operates in the usual manner with a ratchet wheel, 62, the motion of this wheel being transmitted by suitably proportioned gear wheels, 63, to the last wheel, 64, of the train, to which the turbine wheel is secured by means of the clamping plate, 65.

The dividing motion mechanism just described is supported on a suitable steel, 66, which may itself be adjustable with regard to the bed plate, if desired.

The necessary adjustments to allow for different blade spacings are preferably made by altering the ratchet wheel, 62, or by setting the movable stops, 59, so as to cause the pawl, 61, to take the required number of teeth, and leaving the gear wheels, 63, 64, unchanged.

Referring to figures 17 and 18, the method of controlling the motion of the shaft, 42, will now be

described.

To the end of the main shaft, 42, a hollow prolongation of sleeve, 67, is rigidly secured, this sleeve being supported in suitable bearings, 68, and containing in its centre an easily fitting steel rod, 69. On the sleeve, 67, two loose pulleys, 70, 71, are mounted, adapted to run in opposite directions, the bosses of these pulleys being coned to form the male elements of friction clutches. The corresponding female clutches, 72, 73, slidably mounted on the sleeve, 67, are secured to the central rod by cotters, 74, which pass loosely through slots, 75, in the sleeve, 67. Thus a pull on the central rod in either direction will engage one or other of the clutches and the corresponding pulley will then drive the shaft.

As the gear is arranged in the machine described above, it is necessary for the shaft to make twenty revolutions only in the one direction, then to stop automatically and when started again by the attendant, to make exactly twenty more revolutions in the other direction and so on. This is provided for as follows:-

An extension, 76, of the central rod, 69, outside the sleeve, 67, is screwed and engages with a nut, 77, which is prevented from rotating by means of a suitable flat surface formed upon it. As the rod, 69, rotates, the nut, 77, travels along the rod until it comes in contact with one or other of the fixed adjustable stops, 78, through the centre of each of which the rod loosely passes. The nut, 77, being prevented from travelling further, any continuance of the sleeve's rotation, causes the central rod, 67, to be drawn through the nut, thus releasing the particular driving clutch engaged and stopping the shaft, 42.

It is impossible for the attendant to start the shaft again in the same direction, but by pulling the central rod a little further in the same direction as it was drawn by the nut, the other clutch will engage and the shaft run backwards until automatically stopped as before. For the purpose just mentioned, a forked starting handle, 79, pivoted on the bracket, 80, and engaging with collars, 81, in the central rod, is provided.

The two loose pulleys are preferably of different sizes, so that a slower speed is given to the main shaft when the slotting head is cutting than when it is returning.

It will be understood that the automatic stopping mechanism just described is shown detached from the rest of the machine in plan and elevation merely for convenience in drawing as it is preferably mounted on the same rigid frame work as the welding head and other parts above described as indicated in end view in figure 14.

Referring now to figures 19 and 20, details are given of the jaw holder already referred to in the general description of the machine, the stop, y, alone being omitted.

According to the form illustrated, the jaw holder, y, is provided at the end remote from the blade with a circular shank, 62, which is clamped in its bearing at any suitable angle as already described. The blade end of the jaw holder is separated into two branches by means of the slot, ^w1, each part carrying a copper jaw, u, shaped so as to clear adjacent blades; between the jaws, u, the blade to be welded is clamped and in order to ensure a good contact and rigid holding of the blade in the jaws, a clamping device is preferably arranged in addition to that provided by the spring of

the jaw holder, the two branches of the jaw holder.

According to one form, links, 83, are pivoted at 84, to one branch of the jaw holder, while short cross links, 85, connect the links, 83, to the other branch, to which they are pivoted at 86. The long links, 83, are curved as shown and are connected at their non-pivoted ends by the cross piece, 87, to which pressure to clamp the blade is applied in the direction of the arrow (see figure 19) by means of the cam, 88, and hand lever, 89, both of which are secured to a common axle rotatably mounted on any convenient pillar, 90, or the like. A spring, such as 91, serves to return the links when the blade is released.

A modification of the clamping device just described is shown in figures 21 and 22, parts corresponding to the previous modification being denoted by the same reference symbols. The links, ^{83,} in this modified form are curved in a contrary direction to those of figures 19 and 20 and their ends are united by an armature, 92, adapted to be attracted by one or more electromagnets, 93, supported in any convenient manner on a bracket or the like secured to the crosshead, 2. The energising current to the magnets may, if desired, be switched on and off automatically.

In the case where blades are to be welded to a turbine ring, the arrangement of parts is essentially the same as that already described with the exception that the ring encircles the welding head.

It will be seen that certain parts of the machine are not completely automatic in their operation but these parts may be readily made so if the additional complication involved is not considered undesirable.

Although the machine has been described with a

slotting head attachment, it will be obvious that in order to carry into effect other of the methods described in the first part of the invention, means for drilling, graded circular cutters or other devices provided with the suitable adjustments required for carrying out the necessary mechanical operations may be substituted.

Having now described my invention what I claim as new and desire to secure by Letters Patent is:-

1. Process for the attachment of turbine blades

to their carriers, consisting in so adjusting the periphery of the volume of metal in the carrier in the neighbourhood of by limiting the cross sectional area available for the conduction of heat therefrom, the point of attachment that on heating locally, said blade and said carrier rise to approximately the same temperature and welding the blades to said carriers so prepared, as set forth.

2. Process for the attachment of turbine blades

to their carriers, consisting in so adjusting the ing the volume of metal in the carrier in the neighbourhood of by limiting the cross sectional area available for the conduction of heat therefrom the point of attachment that on heating locally, said blade and said carrier rise to approximately the same temperature and electrically welding the blades to said carriers so prepared, as set forth.

2. A. Process for the attachment of turbine blades

to their carriers, consisting in so ~~removing~~ removing the periphery of the metal from the carrier in the neighbourhood of the point of attachment that on heating locally said blade and said carrier rise to approximately the same temperature and electrically welding the blades to said carriers so prepared, as set forth.

3. A. Process for the attachment of turbine blades

to their carriers, consisting in so grooving the periphery of the carrier in the neighbourhood of the point of attachment that on heat-

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ing locally, said blade and said carrier rise to ap-
 Oct. 10, 1905 proximately the same temperature and electrically
 welding the blades to said carriers so prepared, as
 set forth.

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 Apr. 9, 1906 5. The combination of a turbine blade carrier
 with blades thereto, as set forth.

Sub. D.
 Oct. 18-06 6. The combination of a turbine blade carrier
 Apr. 9, 1906 with blades electrically welded thereto, as set forth.

7. A bladed turbine element, comprising in com-
 the peripheral portion of
 Oct. 10, 1905 bination a blade carrying element, the volume of which
 in the neighbourhood of the point of attachment of the
 blades has been so adjusted as to retard the flow of
 heat away from said point of attachment together with
 blades welded to said carrying elements, as set forth.

8. A bladed turbine element, comprising in com-
 bination a blade carrying element, the volume of which
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 Oct. 10, 1905 in the neighbourhood of the point of attachment of the
 blades has been so adjusted as to retard the flow of
 heat away from said point of attachment together with
 blades electrically welded to said carrying elements,
 as set forth.

Sub. D
 Oct. 18-06 6. 9. A bladed turbine element, comprising in
 Apr. 9, 1906 combination a blade carrying element, the peripheral portion of
 has been removed in the neighbourhood of the point of
 Oct. 10, 1905 attachment of the blades so as to retard the flow of
 heat away from said point of attachment together with
 blades welded to said carrying elements, as set forth.

7. 19. A bladed turbine comprising in combination
 having its peripheral portion
 Apr. 9, 1906 a blade carrying element, grooved in the neighbourhood
 of the point of attachment of the blades so as to
 Oct. 10, 1905 retard the flow of heat away from said point of at-
 tachment together with blades welded to said carrying
 elements, as set forth.

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 Oct. 10, 1905

11. A machine adapted to weld turbine blades to their carrying elements, as set forth.

12. A machine adapted to electrically weld turbine blades to their carrying elements, as set forth.

13. A machine adapted to electrically weld turbine blades to their carrying elements comprising in combination means for causing a blade and its carrying element to approach and be ~~XXXXXX~~ pressed together; means for leading current to and from the welding point together with means for setting the blade carrying element in position for the next weld, substantially as described.

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14. A machine adapted to electrically weld turbine blades to their carrying elements comprising in combinations means for causing a blade and its carrying element to approach and be pressed together; means for leading current to and from the welding point; means for removing metal from said carrying element in advance of the welding point together with means for setting the blade carrying element in position for the next weld, substantially as described.

15. A machine adapted to electrically weld turbine blades to their carrying elements comprising in combination a rotatably mounted blade carrying element stool; a blade clamp; a slidably mounted welding head carrying said blade clamp together with means for causing said blade clamp to approach said stool, substantially as described.

16. A machine adapted to electrically weld turbine blades to their carrying elements comprising in combination, means for causing a blade and its carrying element to approach; a toggle device for producing pressure at the welding point; means for

leading current to and from said welding point together with means for setting the blade carrying element in position for the next weld, substantially as described.

17. A machine adapted to electrically weld turbine blades to their carrying elements comprising in combination, a slidably mounted welding head; means including a crank and pitman for reciprocating said welding head together with means for causing said crank to stop automatically at the end of each half revolution, substantially as described.

18. A machine adapted to electrically weld turbine blades to their carrying elements comprising in combination, a rotatably mounted blade carrying element stool; a slidably mounted welding head; means for causing said welding head to reciprocate together with means operated from said welding head for turning said stool into a position for the next weld, substantially as described.

19. A machine adapted to electrically weld turbine blades to their carrying elements comprising in combination, means for causing a blade and its toggle carrying element to approach; a ~~contact~~ device for producing pressure at the welding point; a switch together with means operated from said toggle for opening said switch when the weld is completed, substantially as described.

20. A machine adapted to electrically weld turbine blades to their carrying elements comprising in combination, a slidably mounted welding head; means for reciprocating said welding head; a switch together with means operated from said reciprocating means for closing said switch, substantially as described.

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21. A machine adapted to electrically weld turbine blades to their carrying elements comprising in combination a slidably mounted welding head; means for reciprocating said welding head including a main motion shaft; clutches adapted to drive said shaft in either direction together with means including a travelling nut and a screwed slidable extension of said shaft for stopping said shaft at each end of the travel of said welding head, substantially as described.

Insert L¹

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In witness whereof I hereunto set my hand in presence of two witnesses.

Sebastian Ziani de Ferranti

Francis James Bignell

Walter, J. Skerten

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CONSULATE - GENERAL OF THE UNITED STATES
OF AMERICA FOR GREAT BRITAIN & IRELAND AT LONDON.

I, Henry Clay Evans Consul-General of the United States of America at London, England do hereby make known and certify to all whom it may concern that Wilmer Matthews Harris who hath signed the annexed Certificate, is a Notary Public, duly admitted and sworn and practising in the city of London, aforesaid, and that to all acts by him so done full faith and credit are and ought to be given in Indicators and thereout.

In Testimony Whereof, I have hereunto set my hand and affixed my Seal of Office at London aforesaid, this 28th day of April in the year of our Lord One Thousand Nine Hundred and four

H Clay Evans
Consul-General.



SEAL

OATH.

London }
 England } ss:

WMH I, Sebastian Ziani de Ferranti, the above named petitioner,
 being sworn (or-affirmed) depose and say that I am a subject of the
 King of Great Britain and Ireland and resident of 31, Lyndhurst Road,
 Hampstead, London, N.W., England, that I verily believe myself to be
 WMH the original, first, and sole inventor of the improvement-in
 Process and Apparatus for Electrically welding turbine blades to
 their carrying elements" described and claimed in the annexed
 specification; that I do not know and do not believe that the same
 was ever known or used before my invention or discovery thereof, or
 patented or described in any printed publication in any country before
 my invention or discovery thereof, or more than two years prior to
 this application, or in public use or on sale in the United States
 for more than two years prior to this application; and that no appli-
 cation for patent on said improvement has been filed by me or my
 representatives or assigns in any country foreign to the United States,
 except as follows: Great Britain, No. 11921 dated May 25th 1903,
 and No. 15186 dated July 9th 1903

Sebastian Ziani de Ferranti

Sworn to and subscribed before me this 26th day of April, 1904.

Wilmer M Harris

Notary Public

London

Foreign Fee Stamp.

SEAL

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Div. 32. Form 107

2-260

Paper No. 1

The Commissioner of Patents,
Washington, D. C.,
and not any official by name.

All communications respecting this
application should give the serial number,
date of filing, title of invention, and
name of the applicant.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

WASHINGTON D. C., June 22, 1904.

MAILED

Sebastien Z. de Ferranti,
C/o Spear, Middleton, Donaldson & Spear,
City.

Please find below a communication from the EXAMINER in charge of ^{your} application of
#208,034, filed May 14, 1904, for Process and Apparatus for Elec-
trically Welding Turbine Blades to their Carrying Elements.

F. I. Allen.
[Signature]
Commissioner of Patents.

A new oath should be filed in accordance with the requirements
of Rule 46. See ex parte Levenstein & Maef, 110 O.G., 1726.

Division is required in this case under Rule 41, since claims
1 to 4, inclusive, are drawn to a process; claims 5 to 10, inclusive,
are drawn to an article; and claims 11 to 21, inclusive, are drawn
to a machine.

Action on the merits will accordingly be deferred until
applicant limits his claims to a single invention.

W A Cowles

Actg.

W.J.S.

APPLICATION ROOM
SEP 27 1904
U.S. PATENT OFFICE

DIV. 37, PAPER NO. 2

Amd't.A.

Room 107.

Sept 27, 1904

S. Z. de Ferranti.

Process and Apparatus for Electrically Welding Turbine Blades
to their Carrying Elements.

Filed May 14, 1904.

#208,034.

To the Commissioner of Patents:

✓ Page 2 line 1 cancel "first part of the"

✓ Page 2 erase lines 6 to 9 inclusive.

✓ Page 2 line 10 erase colon and dash and substitute "which,
with the exception of figure 4, show the invention applied, by
way of example, to a type of parallel flow turbine in which
the blades are mounted on the edge of a wheel like body"

✓ Page 2 line 11 after "of" insert such and erase "
turbine "

✓ Page 3 erase lines 13 to 27 inclusive, i. e., from "fig-
ures 12" through to electromagnetically"

✓ Page 3 line 3 from bottom erase "first part of the"

✓ Page 6 line 6 erase "the first part of the" and substitute
"an" and after "invention" insert such as the present

✓ Page 6 erase last paragraph from "In carrying" to end of
page.

✓ Erase pages 7, 8, 9, 10, 11, 12, 13, 14, 15 and first
seven lines of page 16.

✓ Erase claims 11, 12, 13, 14, 15, 16, 17, 18, 19, 20 and 21

✓ Cancel figures 12 to 22 inclusive of the drawings.

The process and product in this case being so intimately
connected, it is thought that they should be allowed in one
application in accordance with provision of Rule 41.

Respectfully,

S. Z. de Ferrtain,

By Spear Middleton Donaldson & Spear

Sept 25, 1904.

Attys.

DEPARTMENT OF THE INTERIOR
Serial No. 208,034
Rejection.
UNITED STATES PATENT OFFICE

WASHINGTON D. C., January 10, 1905.
MAILED

Sebastian Ziani de Ferranti,
c/o Spear, Middleton, Donaldson & Spear,
Washington, D. C.

Please find below a communication from the EXAMINER in charge of ~~the~~ your
application for Process and Apparatus for Electrically Welding Turbine Blades
to their Carrying Elements, filed May 14, 1904, Serial No. 208,034.

F. J. Allen
~~XXXXXXXXXXXXXXXXXXXX~~
Commissioner of Patents.

Responding to amendment filed September 27, 1904:

Claim 1 is rejected on Parry, 255,329, March 21, 1882,
(Class 78, sub 92). This patent shows in Figs. 6 and 7 the appli-
cation of applicant's principle to the construction of a locomo-
tive frame. To apply this idea to turbine construction is not a
matter of invention. This claim is also rejected as functional
as the clause commencing "consisting," practically sets forth
only the result desired to be attained, viz, uniform heating,
instead of the means employed.

Claim 2 is similarly rejected. Further this claim is
substantially the same as claim 1 and involves an aggregation for
the reason that the particular method of welding, viz, electric-
ally, has no more than its ordinary function in this relation.

Claims 3 and 4 are rejected on Parry. As in claim 2 the
inclusion of electric welding involves an aggregation and further
constitutes an unnecessary limitation.

Claims 5 and 6 are rejected on the British patent to
Roworth, 25,086, of 1893, which shows electrically welded blades.
They are also rejected as unpatentable over the German patent to
Harle, 143,960, of 1900, which shows riveted blades and the U. S.
patent to Elliott, 775,108, Nov. 15, 1904, which shows the blades
bolted on.

Claims 7 to 10 are rejected on the references for claims 5 and 6 in view of Parry cited. These claims and claim 6 are objectionable in form as they define the article by the method of making. See *Riesdon v. Medart*, 71 O.G., 751 and *ex parte Painter*, 57 O.G., 999. The fact that the article must needs be defined by the method of making in order to show novelty, would indicate that if any, only one inventive idea was involved and that was in the process.

E. D. Sewall

B.

APPLICATION ROOM
MAY 23 1905
U.S. PATENT OFFICE.
329
Room 192

Filed May 14, 1904.

Serial No. 208, 034 Paper No. 4
Argmt. and Amdt. B.
Filed May 23, 1905

U.S. PATENT OFFICE,
MAY 24 1905
DIVISION No. 13

S. Z. DE FERRANTI'S U.S. APPLICATION, No. 208,034.

Process & Apparatus for Electrically Welding Turbine Blades, &c.

To the Commissioner of Patents:

The following is submitted in
Reply to the Official Letter of January 10th, 1905.
and to be considered in connection with the explanatory sketches hereto attached.

Applicant believes that the U. S. Patent to Parry, No. 255,329, figures 6 and 7, has little or no relevancy to applicant's invention and does not justify the Examiner in rejecting certain of applicant's claims.

The welding of turbine blades to their carriers is an operation of very considerable difficulty and delicacy by reason especially of (1) the great disproportion in size between the blade and carrier and (2) the close juxtaposition of the blades. The first condition renders it difficult to bring the welding points of the two elements to the proper temperature simultaneously without burning the blade; the second condition necessitates a very accurate concentration of heat at the welding point so as to avoid damage to the blades already fixed at a given moment.

The difficulties mentioned do not occur in the manufacture of a locomotive frame; it is to be noted that the portion, B, of the frame is quite comparable in magnitude with the various portions, D, both being of the same thickness and considerable masses of metal, and no difficulty whatever occurs owing to the close juxtaposition of the parts, D. The recesses between the projections, d, in the part, B, of the frame play no part whatever in the actual welding

operation; it will be seen that they are made alternately deep and shallow for the evident purpose of producing the desired contour of the frame. The parts, d, can be easily heated in the smith's fire in turn one after the other, there being ample space between the parts, d, to enable the heating of each part, d, to be effected without detriment to the neighbouring parts, d. It is thought that the figures in question disclose very little which a smith could not accomplish without special instructions; the only new point so far as the smith is concerned being the Founding of the butting portions (see figure 8). That this is the essential novelty of the invention and not the recesses on the part, B, is clearly shown in the description and particularly in claim 2. It is thought that the recesses in question are purely accidental and play no useful part whatever in the actual process of welding. A sketch is submitted herewith of a locomotive frame in which the recesses between the parts d are replaced by projections; applicant confidently submits that the welding process would not suffer in any way by such substitution so long as the essential rounding winding of the parts d is maintained.

The logical outcome of the Examiner's contention as to disclosure is that a skilled workman, if given a turbine wheel and a set of loose blades could set to work and weld the blades in place without further assistance than the information given in Parry's specification. If the Examiner will put

himself in the workman's place, he will see that success under such circumstances would be little short of miraculous. How, for instance, would it be possible to heat the wheel at the welding point without burning off the blades already in place?

In point of fact, the peculiar conditions which render the welding of turbine blades in place a difficult operation do not exist in the manufacture of a coarse article such as a locomotive frame; they, therefore, were not discussed in Parry's specification and a fortiori no means were disclosed for overcoming them.

In view of the above remarks it is thought that the Examiner's further contention as to the words "electric welding" in claim 2 being an unnecessary limitation is also unsupportable. It is possible, though improbable, that having prepared the blade carriers as described by applicant, it would be possible to heat the welding points by some form of hot blast or the like; applicant, therefore, in claim 1, claimed welding broadly since he believes no one has yet succeeded in producing a bladed carrier with the blades secured in place solely by a butt weld of the type in question and he is entitled to a broad scope of protection. If, however, claim 1 was declared void for any reason, claim 2 for "electrical welding" would still be good since actual success has attended this process, the electrical welding having the specially advantageous property of definitely localising the heat. It will of course be obvious

to the Examiner that the expression "electric welding" is used not in the sense of producing the required heat by playing upon the welding point with an electric arc but by means of the high resistance offered to the passage of electric current past the welding point..

Claims 5 and 6 are re-submitted and the Examiner is requested to point out the relevancy of the German patent to Harlé, No. 143,960 and the U. S. patent to Elliott, No. 775,108. It is not seen in what sense a turbine wheel having blades welded on is anticipated by wheels having blades riveted or bolted on. The welded article is a distinct improvement qua article and approaches closely the ideal form in which wheel and blades are fashioned out of one block of metal.

With regard to the British patent to Raworth, No. 25086/93, each blade is electrically welded to a root-piece ^{thus} forming a unit, the separate units being then built up into a wheel rim in various ways. Probably the welding could be effected without difficulty since blade and root-piece are comparable in size and each unit can be manufactured separately thus avoiding the difficulty caused by the close juxtaposition of the blades as explained above. Moreover, Raworth's finished article is clearly inferior to applicant's, including as it does parts such as the side plates and retaining nuts which can work loose. Additional claims introducing the term "plurality of blades" are filed herewith..

Claims 7 to 10 are also re-submitted since the finding ~~filed~~ in ~~ex parte~~ Painter, 57 O.G., 999, includes the following:-

"A claim for an article of manufacture should not as a rule be defined by the process of producing it; but when an article of manufacture cannot be properly defined except by reference to the process of producing it, a case is presented which constitutes a proper exception to the rule."

It is submitted that the present case is such a "proper exception"; applicant believes himself the first to produce a turbine element having the blades directly secured in place by a butt weld. Such a turbine element is an advance on anything hitherto brought out and protection should not be refused merely on account of limitations in the English and American languages.. If an accepted word existed for a turbine element with butt welded blades, a claim for such element would be allowed as a new article, as such a word does not exist, applicant contends that the only course left open is to define the article by the method of manufacture.

Reconsideration of the case is respectfully solicited.

1202

✓ Please insert the following additional claims:-

11- As a new article of manufacture, a bladed turbine element having a plurality of closely spaced blades attached to the periphery of said carrier by direct butt welds.

Canceled
Oct.10,1905

12- As a new article of manufacture, a turbine carrier the rim of which is formed of circumferentially continuous metal together with a plurality of closely spaced blades attached to said continuous portion by direct butt welds.

13- As a new article of manufacture, a turbine carrier having circumferential peripheral grooves with intervening projections together with a plurality of closely spaced blades, each blade being attached to at least two of said projections by direct butt welds.

✓ In claims 1 and 2 line 4 after "attachment" insert-
by limiting the cross sectional area available for the
conduction of heat therefrom.

Respectfully,

S. Z. de Ferranti,

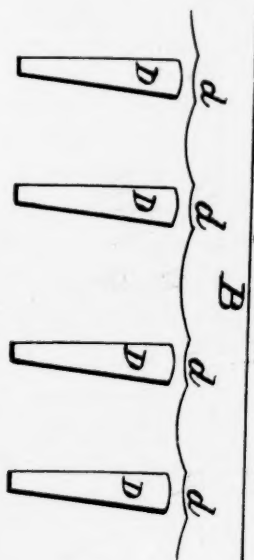
By-Spear, Middleton, Donaldson & Spear

Attys.

May 20, 1905.

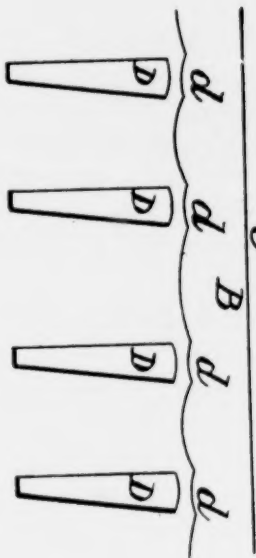
U. S. Patent to Perry, No. 255329.

Fig. 6.



U. S. Rattle & Tany, No. 255329.

Fig. 6.



1205

Div. 13 P. OM. 329

2-200

Paper No. 5 Rej.

Address:
 "The Commissioner of Patents,
 Washington, D. C.,"
 and not any official by name.

All communications respecting this
 application should give the serial number,
 date of filing, title of invention, and
 name of the applicant.

D

DEPARTMENT OF THE INTERIOR

Serial No. 208034

ARW

UNITED STATES PATENT OFFICE

WASHINGTON D.C., August 5, 1905.

MAILED

Sebastian Z. de Ferranti.

C/o Spear, Middleton, Donaldson & Spear,

Washington, D. C.

Please find below a communication from the EXAMINER in charge of ^{YOUR} the application of

#208,034, filed May 14, 1904, for "Process & Apparatus for Electrically
 Welding Turbine Blades to their Carrying Elements".

F. I. Allen.
~~XXXXXXXXXXXXXXXXXXXX~~
 Commissioner of Patents.

Responding to amendment filed May 23, 1905.

The patent to Perry is waived as a reference. Claims 1, 2, 3 and 4 are rejected as presenting nothing patentable over Swedish patent to Jottrand, #17,093, March 19, 1903, (78-94). This patent discloses, in figures 3 and 4, the idea of reducing the cross-section of the heavier piece of metal in order to secure uniform heating at the welding point. Claim 2 is still considered unpatentable over claim 1, and claim 3 is the same in effect as claim 2.

Claims 5, 6, 11 and 12 are required to be divided out of the case, as the article could be produced by a process other than that recited in claims 1 to 4 (ex parte Erdman, 93 O.G., 2831).

The objection as to defining by the term "welding" in claims 7, 9 and 10 is withdrawn, but such objection relative to electric welding still holds as regards claim 8, for the reason that the term "electrically" imports no characteristic of the article, and has to do simply with the manner of making.

Claims 7, 8, 9, 10 and 13 are rejected as unpatentable over DeLaval, #522,066, June 26, 1894, (121. Rotary Impnet, Axial Flow). This patent shows the turbine body with integral blades. The same turbine with a welded connection for the blades instead of an integral one is not considered patentable, for the reason that, except as to the manner of making, the two articles are the same, and if the weld is a good one the blade and the body are integral.

B

E. D. Sewall.

Examiner, Division 13.

1206

APPLICATION ROOM
OCT 10 1905
U.S.PATENT OFFICE.
Room 107

Serial No. 208034 Paper No. 6
Amendment. C
Filed Oct. 10, 1905

U.S.PATENT OFFICE,
OCT 12 1905
DIVISION No. 13

S. Z. de Ferranti.

Process and Apparatus for
Electrically Welding Turbine
Blades to their Carrying Elements.

Filed May 14, 1904.

#208034.

To the Commissioner of Patents:-

Please amend the above entitled case as follows:-

In title erase the words "and Apparatus".

✓ Cancel claim 2.

✓ Claim 3, line 6, cancel "electrically" and renumber to 2.

✓ Claim 4, line 5, cancel "electrically" and renumber to 3.

✓ Insert as a new claim:-

C
Pub. D.
Oct. 18-06

4. ~~Process for the attachment of turbine blades to their carriers, consisting in forming circumferential grooves with intervening rings of metal around the carrier thereby limiting the cross sectional area available for the conduction of heat from the point of attachment so that on heating locally, said blade and said carrier rise to approximately the same temperature and welding the blades to said carriers so prepared, as set forth.-~~

✓ Claim 7; renumber to 5 and line 4 cancel "the" between "retard" and "flow."

✓ Cancel claim 8.

✓ Claim 9; renumber to 6 and line 4 cancel "the" between "retard" and "flow".

✓ Claim 10; renumber to 7 and line 4 cancel "the" between "retard" and "flow".

Insert as a new claim:-

sub. D. 8. A blade turbine element, comprising in combination a
Oct. 18-06 blade carrying element having circumferential grooves with
intervening projecting rings of metal formed thereon and welded blades
across the edges of at least two of said projecting rings, as
set forth.-

✓ Cancel claims 11 to 13 inclusive.

With regard to the Examiner's rejection of the claims for the article on the U. S. Patent No. 522066, Laval, it is thought that the turbine wheel shown in the specification is purely diagrammatic and was purposely shown so by the patent attorney who drew the specification, since the method of attachment of the blades to the wheel formed no part whatever of the invention concerned. Applicant submits that this specification is not a fair disclosure of a wheel having blades integral therewith. Moreover it is thought that there are many forms of bladed turbine wheels and the like which it would be quite impossible to produce out of a solid block of metal, such for instance, as a turbine wheel having comparatively long blades very closely spaced with regard to one another. Such a wheel could, however, be readily produced by applicant's process.

Taking the four claims for the article now on file, it will be seen that these call specifically for a turbine element in which, (1) the volume of metal has been adjusted in the neighborhood of the point of attachment of the blade; (2) metal has been removed in the neighborhood of the point of attachment; (3 & 4) grooves have been cut; and moreover, welded blades are called for in each case. All these features are new over Laval, in which no metal has been removed, no grooves have been cut and the blades are not welded on..

It therefore appears that a different article must necessarily have been produced. A turbine wheel or the like having blades welded thereto is new in the art, and it appears that whether it has advantages or disadvantages as compared with the existing turbine wheels, it is, nevertheless, a substantially different article to one in which the blades are integral with the wheel or welded or bolted thereto.

Applicant respectfully submits that the Examiner has himself admitted this by withdrawing his objection to the use of the word "welding" in defining the article.

As regards the citation of the Swedish patent to Jottrand #17093 of March 19, 1903, applicant submits the following statement:—

The present application was filed in America on May 14, 1904, and the British equivalent application #11921, 1903, was filed in England on May 25, 1903, as proved by the oath. Consequently it is believed that under the terms of the International Convention, to which Great Britain and America are parties, no publication subsequent to the date of filing in England, viz., May 25, 1903, affords grounds for the rejection of claims in the American application. Now the Swedish Patent to Jottrand #17093, was not published until Feb. 13, 1904, as shown by the note "Offentliggjord den 13 Februari 1904" at the foot of page 2 of the Swedish specification; it is therefore thought that the citation of the Swedish specification is not in order on the part of the U. S. Office in the present instance.

Respectfully,
S. Z. de Ferranti,
By Spear Middleton Donaldson & Spear

Oct. 9, 1905.

Atty's.

Div. 13 From 329

Adm. &
"The Commissioner of Patents,
Washington, D. C.,"
and not our official by name.

2-200

M.E.L.

Paper No. 7 Ref.

All communications respecting this
application should give the serial number,
date of filing, title of invention, and
name of the applicant.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

WASHINGTON D.C., Dec. 16, 1905.

MAILED

Sebastian Ziani de Ferranti,

Care Spear, Middleton, Donaldson & Spear,

Washington, D. C.

your

Please find below a communication from the EXAMINER in charge of the application of
for Process and Apparatus for Electrically Welding Turbine Blades
to their Carrying Elements, filed May 14, 1904, Ser. No. 208,034.

F. I. Allen
[Signature]
Commissioner of Patents.

In response to amendment filed October 11, 1905:

Requirement for a new oath in accordance with decision of
Levenstein & Naef, referred to, is repeated.

Claims 4 and 8, it is thought, may be allowed. The
examiner believes that an invention was made in the production
of the article defined in claim 8. Whether the invention is in
the process or the article may be somewhat doubtful and for that
reason it is believed to be proper to allow both claims in the
same application.

All of the other claims are rejected in view of the
references cited, and the additional reference, patent to Cowdery,
481,663, August 30, 1892, Class 76, Subclass 111. The application
of the old method disclosed in Cowdery to the manufacture
of a turbine wheel is thought to involve no invention.

Attention is invited to the fact that claims 5 and 6
of the original specification have not been canceled although
applicant's procedure indicates that he intends to cancel them.

Pen and ink drawings are required.

F. D. Sewall

Examiner, Division 13.

1210
APPLICATION ROOM
APR 9 1906
U.S.PATENT OFFICE.

Serial No. 208,034 Paper No.
Amendment
Filed April 9, 1906

Room 107.

U.S.PATENT OFFICE
APR 11 1906
DIVISION 13

S. Z. de Ferranti.

Process and Apparatus for Electrically
Welding Turbine Blades to their Carrying Elements.
Filed May 14, 1904.
#208034.

To the Commissioner of Patents:

Referring to the U. S. patent to Cowdery, #481663, cited
by the Examiner, applicant desires to submit the following
statement.

It is thought that the method of Welding the braces to
the heads of rakes disclosed by Cowdery cannot be held to be
an anticipation of applicant's method according to U. S. patent
law unless (1) a mere application, involving no ingenuity what-
ever, is possible of Cowdery's method to turbine work, and (2)
unless the arts of rake making and turbine building are reason-
ably cognate.

Applicant believes that neither of these conditions in
point of fact exists. Cowdery's method of stamping out a blank
with two lugs which he subsequently bends at right angles is
obviously inapplicable as it stands to turbine work and for this
reason something more than the mere application required by
law is necessary to adapt it. Thus the "crescent-moon" section
of a turbine blade made it impracticable, after the broad prin-
ciple had been discovered, to form projections of similar section
on the turbine wheel in the manner disclosed by Cowdery and much
trial work was necessary in view of the pronounced disproportion
in dimensions between turbine wheel and blades before it could
be confidently stated that the methods disclosed in applicant's
specification were or were not successful.

1211

Applicant wishes especially to emphasize the fact that it is the great disproportion in dimensions between turbine wheel and blade which has occasioned the practical difficulties met with which have hitherto prevented a welded turbine element of the type in question being produced. This difficulty does not occur in the rake shown by Cowdery where the section of the braces to be welded is apparently the same as that of the base member of the head to which it is held, both parts being considerable masses of metal of no great difference in size.

Furthermore, it is thought that the arts of rake making and turbine building cannot be considered so closely allied that processes known in the one art can be considered available for use in the other. Applicant with a large practical experience in all branches of engineering, believes that no common knowledge existed at the time of his invention which would assist in the solution of the blade-welding problem, and it is thought that a very special process confined solely to such a backwater of the engineering trade as rake-making cannot be held to be such "common knowledge" and should not preclude the grant of a patent for improvements in an art of the importance of turbine-making.

Reconsideration of the case is respectfully solicited in view of certain of the following amendments drafted in order to connect the invention more definitely with turbine production.

✓ Cancel claims 5 and 6 of the original specification.

✓ Claim 1, line 3; claim 2 line 3; claim 3, line 2; between "the" and "camer" insert-periphery of the-

✓ Claim 5, line 2; claim 6 line 2; before "which" insert - the peripheral portion of-

✓ Claim 7 line 2; after "element" insert-having its peripheral portion-

Applicant is considering the question of filing a divisional application.

A new oath and drawings will be filed before this case goes to issue.

Respectfully,

S. Z. de Ferranti,

By-

Spear, Middleton, Donaldson & Spear

Attys.

Apr. 6/06.

AMT

Address:
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

Paper No. 2 Rej.

All communications respecting this
application should give the serial number,
date of filing, title of invention, and
name of the applicant.

Serial No. 208034

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

AEW

WASHINGTON D.C., May 1, 1906.

MAILED

Sebastian Z. de Ferranti,

C/o Spear, Middleton, Donaldson & Spear,

Washington, D. C.

Please find below a communication from the EXAMINER in charge of ^{your} application of
#208,034, filed May 14, 1904, for "Process & Apparatus for Electrically
Welding Turbine Blades to their Carrying Elements".

F. I. Allen

Commissioner of Patents.

Responding to amendment filed April 9, 1906.

Attention is again called to the requirements for a new oath
and for pen and ink drawing.

Claims 1, 2, 3, 5, 6 and 7 have been carefully reconsidered,
and they are rejected on the references and for the reasons of record.

Claims 4 and 8 stand allowed.

E.A.P.

E.D. Sewall

Examiner, Division 13.

APPLICATION ROOM
OCT 18 1906
U.S. PATENT OFFICE

U.S. PATENT OFFICE,
OCT 19 1906
DIVISION No. 13

Serial No. 208034
Paper No. 10
Argument and Amendment.
Filed Oct. 18 1906

Room 329
S. Z. de Ferranti.

Process and apparatus for Electrically welding turbine
Blades to their Carrying Elements.

Filed May 14th, 1904.
208034

To the Commissioner of Patents.

With respect to the reference Cowdery of record applicant wishes to point out that there is no disclosure of his process by Cowdery; on a careful perusal of Cowdery's specification it will be evident to one skilled in the art that Cowdery's method consisted in heating the parts separately to a welding heat before uniting them as in lines 55 et seq he causes "the meeting surfaces which have been heated to welding heat by the current to be brought against each other and uniting them." There is no dubiety in the language of the specification; the parts have been heated to welding heat before being brought together, so that Cowdery's method presents no similarity to the applicants in which the welding current is lead across the junction of the parts to be welded. That such a method was never invented by Cowdery is evident from the passage quoted above and also to the following parts of his specification. In line 44 et seq. Cowdery intimates his intention of applying electric welding to the manufacture of his rakes. There are three kinds of welds which present themselves to his mind viz., Butt, scarf or T welds. It must be borne in mind that these joints are intended to be formed electrically and the problem which he has to solve is which joint will be preferred for his rake. He chooses the

butt or scarf weld in preference to the T weld his reason for such preference being as stated in line 59 that if T welds were formed it would be necessary to heat the whole head of the rake to the welding temperature. Had Cowdery even contemplated using the applicant's method in which the welding current is led across the junction of the parts to be welded no heating of the entire head of the rake would have been necessary and owing to the parts being of similar cross section a perfectly good weld could have been formed. In order to avoid clamping the whole head of the rake in the clamps and heating to welding heat, Cowdery forms two projecting lugs on the head and thus obviate the necessity of raising the whole of the head to the welding temperature. These lugs were clamped between the terminals of a suitable welding circuit heated to welding heat and then united to the braces which had been similarly heated.

This interpretation of Cowdery's specification, applicant submits is the only one which agrees with the language used in the specification and applicant holds that the diversity of the respective arts should not allow a strained interpretation to be put on Cowdery's specification to the detriment of an invention which has solved the problem of expeditiously attaching turbine blades to their carrying elements in an exceedingly effective manner. Furthermore the problem before Cowdery was that of attaching two parts by electric welding which were situated remote from one another; in fact an ordinary piece of electric welding which would present little or no difficulty to any person once the idea of electric welding was

known as the heat capacities of the parts were practically equal. In the applicants invention however the difficulties of welding efficiently masses of metal which differ in proportion to their heat capacities as much as 10,000 and over to 1 would in no whit be minimised by a perusal of Cowdery's specification while in addition to such difficulty a further one is presented by the exceedingly close juxtaposition of the blades. It will be evident that this latter difficulty is entirely overcome by the method which the applicant has shown in his specification, i.e., by limiting the cross sectional area at the point of attachment. This method allows the heat to be concentrated or localised at the welding point and so prevent heating of an unnecessary large amount of metal in ~~that~~ ^{the} neighbourhood of the weld. Without any localisation of the welding parts it will be obvious that the rate of welding would be greatly decreased as the time required to heat the parts to the welding temperature would be increased owing to larger mass of metal to be heated.

The above difficulties do not occur in Cowdery's method so that his invention cannot in the applicants opinion be deemed an anticipation ^{of} ~~the~~ ^{the} applicants invention which has solved the difficult problem of uniting turbine blades to their carrying member in an expeditious, economical and satisfactory manner.

With respect to Raworth of record applicant submits that in the specification the blades are not welded directly to their carrying element, the welding being simply mentioned as an alternative for soldering the blades to the rings and that the claims as now amended are clear of the above and other references

12171
cited by the Examiner.

Claims 1 and 2 have been amended so as to clearly process and Cowdery's; differentiate between the applicant's claim 3 has been refiled as none of the references show "grooving the carrier in the neighbourhood of the point of attachment". The pertinency of the reference is not seen. Claims 4 and 7 as now on file have been allowed; claims 5 and 6 have been substituted for those rejected on the last official action. A reconsideration of the case is respectfully solicited on the above grounds and it is hoped that the case will soon pass to an early allowance.

Cancel all the claims and substitute the following:-

16 07
Feb. 16-07
Canceled
Apr. 19, 07.
2. Process for the attachment of turbine blades equalizing the heat capacity of the welding parts by to their carriers, consisting in limiting the cross sectional area of the carrier available for conduction of heat from the point of attachment, causing blade and carrier to contact and leading welding current through the point of contact, as and for the purposes set forth.

Feb. 16 07
" " "
D.
3. Process for the attachment of turbine blades equalizing the heat capacity of the welding parts by to their carriers, consisting in removing metal from the carrier in the neighbourhood of the point of attachment, thereby limiting the cross sectional area available for conduction of heat therefrom, causing blade and carrier to contact and leading welding current through the point of contact, as and for the purposes set forth.

F
4. Process for the attachment of turbine blades to their carriers, consisting in so grooving the carrier in the neighbourhood of the point of attachment that on heating locally, said blade and said carrier rise to approximately the same temperature and welding the blades to said carriers so prepared.

4 - 5 - 4
5. Process for the attachment of turbine blades to their carriers, consisting in forming circumfer-

ential grooves with intervening rings of metal around the carrier thereby limiting the cross sectional area available for the conduction of heat from the point of attachment so that on heating locally, said blade and said carrier rise to approximately the same temperature and welding ^{each} ^{a plurality of said rings} the blades to ^{said} ~~set~~ carriers ~~as prepared~~, as set forth.

per K.

~~Insert E1~~~~Feb. 16-07~~

Canceled

Apr. 19-07.

7.5. A bladed turbine element comprising in combination a blade carrying element having depressed portions on its peripheral area with intervening portions raised relatively to said depressed portions and blades welded to said relatively raised portions, as set forth.

8. 4. A bladed turbine element comprising in combination a body portion; blade carrying members proper attached to said body portion by one face and having blades welded to an opposite face together with spaces intervening between said blade carrying members, as set forth.

F

5 4. 4. → 2.2 A bladed turbine element, comprising in

Canceled

per O

combination a blade carrying element having circumferential grooves with intervening projecting rings

of metal formed thereon and blades welded across the ^{certain} ^{each} blade being welded to a plurality of edges of ~~at least two~~ of said projecting rings, as

per K. per I

~~Insert E2~~~~Feb. 16-07~~

set forth.

Insert H4

Respectively

Sebastian Z. de Ferranti

By Spear, Middleton, Donaldson & Spear

Attys.

H.H.S.

AM.

Div. 13 R. n. 329

2-260

Paper No. 11. Rej.

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

DEPARTMENT OF THE INTERIOR

Serial No. 208034

UNITED STATES PATENT OFFICE

WASHINGTON

December 10, 1906.

MAILED

Sebastian Z. de Ferranti,

C/o Spear, Middleton, Donaldson & Spear,

Washington, D. C.

your

Please find below a communication from the EXAMINER in charge of the application of

#208,034, filed May 14, 1904, for "Process & Apparatus for Electrically Welding Turbine Blades to their Carrying Elements".

F. I. Allen

Thomas Sewall
Commissioner of Patents.

Responding to amendment filed Oct. 18, 1906.

Claim 1, 2 and 3, which are for a process, and claims 5 and 6, which are for an article, are all rejected as being unpatentable over Cowdery, of record. Claims 5 and 6, although for an article, do not set forth and define any structure which patentably differentiates from the patent upon which these claims are rejected.

Applicant is also referred to the patent to Hunter, #690,958, Jan. 14, 1902, as further showing a process of electric welding.

Claims 4 and 7, which are old claims 4 and 8, stand allowed.

E.A.P.

E. D. Sewall

Examiner, Division 13.

1220

APPLICATION ROOM
FEB 16 1907
U.S. PATENT OFFICE

U.S. PATENT OFFICE,
FEB 18 1907
DIVISION 13.

Serial No. 208,034
Paper No. 12
Amendment E and
Argument
Filed Feb. 16th 1907.

Room 239
S.Z. de Ferranti.
Process and apparatus for Electrically welding turbine blades to
their carrying elements.
Filed May 14th, 1904
No. 208034.

To the Commissioner of Patents:-

✓ Insert as claim 1:-

Substitute 1. Process for the attachment of blades to their
F carrying elements consisting in equalizing the heat capaci-
Apr. 19. 07. ties of the welding parts by limiting the cross sectional
a area of the carrier available for the conducting of heat
from the point of attachment, so that on heating locally
said blade and said carrier rise to approximately the
same temperature and welding the blades to said carriers
so prepared.

✓ Renumber claims 1, 2, 3 and 4 as claims 2, 3, 4 and
5 respectively.

✓ Old claim 1, now claim 2, line 2 after "in" insert
"equalizing the heat capacity of the welding parts by";
✓ line 4 change "attachment" to contact

✓ Old claim 2, now claim 3, line 2 after "in" insert
✓ "equalizing the heat capacity of the welding parts by"
line 3 erase "at"
✓ line 4 erase "achment" and insert "contact" therefor.
✓ Insert as claim 6.

6. A bladed turbine element comprising in combina-
tion a blade carrying element and a plurality of blades
Canceled attached thereto by welds, said welds acting to transmit
Apr. 19-07. working stresses between said blades and said carrying
element, as set forth.

✓ Renumber claims 5, 6 and 7 as 7, 8 and 9.

✓ Insert as new claims:-

led
Apr. 19, 07.

10. A welded turbine element comprising in combination a blade carrying element having a circularly disposed aggregation of depressed portions alternating with relatively raised portions and blades welded to said relatively raised portions, as set forth.

11. A bladed turbine element comprising in combination a body portion; a circularly disposed aggregation of blade carrying members proper attached to said body portion by one face and having blades welded to an opposite face together with spaces intervening between said blade carrying members, as set forth.

12. A bladed turbine element comprising in combination a blade carrying element having a plurality of raised portions with relatively depressed portions disposed on both sides of said raised portions and blades welded to said relatively raised portion, as set forth.

The Examiner is reminded that claims 5 and 9 stand allowed.

It is respectfully submitted that the amended claims are free from the reference ⁿ ~~but~~ of record who shows no "equalisation of the heat capacities of the welding parts" which is one of the essential elements of the applicants invention. Hunter arranges the heat capacities of the parts at the welding point in as great disproportion as possible so that the projections on one of his parts become a mass of molten metal before the welding operation is effected.

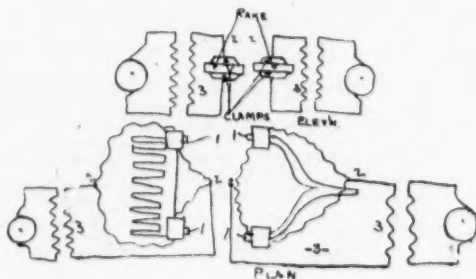
In the applicant's invention the temperature of the parts never rise above the welding temperature and fusion of the parts is carefully avoided.

With regard to Cowdery also of record applicant respectfully submits that as Cowdery does not disclose

one of the steps in applicant's process viz., leading the welding current through the point of contact that the process set forth in the claims rejected on this reference is certainly novel.

Further when the state of the art is examined it is found that one of the great difficulties encountered in the manufacture of turbines ^{is} that of providing efficient means for attaching the blades to the carriers. One of the most usual method of attachment is by means of caulking strips which at best forms an antiquated and very unworkmanlike ^{operation} ~~operation~~ of joint without taking into consideration the time and labour involved.

By means of the process described in his specification the applicant is able to weld blades to the carriers at the rate of 400 per hour while the strength of the weld is such as to permit them to be hammered over at right angles to the position in which they were originally welded. The process which enables blades to be attached so expeditiously and efficiently in comparison with the present cumbersome methods in the applicants opinion ought to be patentable the more especially when it is considered that the anticipating reference relates to a backwater art like rakesmaking and which as will now be shown does not disclose the applicants invention.



Referring to lines 50 to 59 of Cowdery's specification and to the sketches inserted above which have been provided with reference numerals to illustrate Cowdery's method, the following statement is found.

"In electric welding the two pieces, 1, to be welded are suitably clamped in the terminals, 2, of a circuit, 3, carrying a current of large volume and of low tension and the clamps (a), 4, holding the pieces are thereupon brought together with great force bringing the meeting surfaces which have been heated to welding heat against each other and uniting them."

It will be evident that such a method does not disclose the applicant's process as there is no suggestion of leading the welding current through the point of contact.

Cowdery heats each part individually to welding heat on the attainment of which both are forced together. The welded parts of Cowdery's rake are so far apart as to present no difficulty in this connection and the weld could have been effected without the slightest difficulty in the ordinary manner.

To apply Cowdery's process to the rotor for example of a turbine of the Parsons type it would be necessary to keep a cylinder of metal some 6 ft. long say at a welding heat during the whole welding operation, which would obviously be self-damnatory.

The applicant however was the first to perceive that by equalising the heat capacities of the welding parts and leading the welding current across the point of contact thereby localising and concentrating the heat it was possible to electrically weld blades to a rotor successfully both from the practical and commercial standpoints even although the proportion of the heat capacity of the

1324 and
rotor/ blade would in ordinary circumstances amount to as
much as 10,000 to 1.

Cowdery disclosed no adjustment of the heat capacity
because as has been stated above the materials with which
he was dealing were practically of the same size and sec-
tion. Cowdery did not disclose leading the current
through the points of contact; Cowdery's process was a mere
case of substituting one species of welding for another and
lastly the arts of rake and turbine making are not so
closely allied as/ ^{to} amount to mere application. On these
grounds applicant is of opinion that claims ²1, ³2 and ⁴3
ought to be allowed.

With regard to claims ⁷6 and ⁸6 applicant is unable to
perceive how a claim for a bladed turbine element is re-
jected on a rake.

⁷
Claim 6 calls for "a blade carrying element having
depressed portions on its peripheral area with interven-
ing portions raised relatively to said depressed portions"
This claim calls for a plurality of raised portions alter-
nating with depressed portions which is certainly not
disclosed in Cowdery's specification. Claim 8 calls for
"blade carrying members proper attached to the body por-
tion by one face and having blades welded to an opposite
face". Applicant is unable to understand the ^{pertinency} ~~pertinacity~~
of the reference in respect to this claim.

As the article of manufacture claimed is novel in
addition to being stronger and able to be more expeditious-
ly manufactured than those at present on the market it is
thought that the claims at present on file ought to be
allowed.

If the Examiner persists in his rejection of the
claims applicant would esteem it a favour if he would
do so finally in order that the case may be taken to

appeal.

1225

Respectfully,

Sebastian Z. de Ferranti.

By Spear Middleton Donaldson & Spear

Attys.

ADD. IN
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

All communications respecting this
application should give the serial number,
date of filing, title of invention, and
name of the applicant.

Serial No. 208034

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

AEW

WASHINGTON D.C., March 11, 1907.

MAILED

Sebastian Z. de Ferranti,

C/o Spear, Middleton, Donaldson & Spear,

Washington, D. C.

Please find below a communication from the EXAMINER in charge of ^{YOUR} application of
#208,034, filed May 14, 1904, for "Process & Apparatus for Electrically
Welding Turbine Blades to Their Carrying Elements".

F. I. Allen
~~Commissioner of Patents~~
Commissioner of Patents

Responding to amendment filed Feb. 16, 1907.

Claim 1 is rejected on Cowdery, of record. The claim amounts in substance to the process of attaching one set of members (the "braces B) of Cowdery to a second member (the head A of the rake in the same patent), which consists in equalizing the heat capacities of the welding parts by limiting the cross-sectional area of the second member available for the conducting of heat from the point of attachment, so that on heating locally said first member and said second member they rise to approximately the same temperature, and welding the blades to said second member so prepared. Would it not be well for applicant to place a comma after "temperature" in line 7 of this claim?

Applicant in his argument states, on page 4 of the amendment filed Feb. 16, 1907, that "It will be evident that such a method does not disclose the applicant's process, as there is no suggestion of leading the welding current through the point of contact". Applicant is referred to lines 39 to 70 of the Cowdery patent, above referred to. The examiner considers that the said patent discloses the employment of the "process of welding ordinarily employed", which is substantially the same process as that described in the patent to Eyre, #585,160, June 22, 1897, (78-82x), (see page 1 of the specification, lines 27 to 41). It is further considered that the Cowdery patent also discloses

that it is old to weld "by equalizing the heat capacities of the welding parts and leading the welding current across the point of contact" which applicant in his argument asserts that he is the first to perceive (see lines 39 to 70 of the Cowdery patent, above referred to, and especially the subject-matter of lines 66 to 70). Hunter, of record, also shows the welding ^{together} of two members by forming projecting portions and sending the current through and heating locally in the vicinity of the projecting portions.

Claims 2, 3 and 4 are rejected on the references and for the reasons given in the rejection of claim 1.

Claims 6, 7 and 8 are rejected on Cowdery. While these claims are drawn to be for a "turbine element", they define no structure (for example, taking claim 7) which is anything more than an element having in combination a depressed portion (for if there are projecting portions there are depressed portions, and vice versa) on the outer portion with intervening portions raised relatively to said depressed portions, and members welded to said relatively raised portions, as set forth. Such a structure is clearly unpatentable over Cowdery.

Claims 5 and 9 stand allowed.

Claim 10 is broad enough to read on figures 1, 1^a, 2, 5 and 6, and is unpatentable in view of Cowdery..

Claim 11 is for a different species from that for which claim 9 has been allowed, and is not readable upon the same structure which claim 9 represents. Therefore no action on the merits of this claim has been made, and the claim is required to be canceled. Applicant is referred to ex parte Cook, 51 O.G., 1620..

Claim 12 is rejected as claim 10.

E.A.P.

E.D. Sewall
Examiner, Division 13.

12281

APPLICATION ROOM
APR 19 1907
U.S. PATENT OFFICE

U.S. PATENT OFFICE
APR 22 1907
DIVISION 13

Serial No. 208,034
Paper No. 14
Amendment. F &
Argument

Room 107.

Filed Apr. 19 1907

S. Z. de Ferranti.

Process and Apparatus for
Electrically Welding Turbine Blades to
their Carrying Elements.

Filed May 14, 1904.

#208,034

To the Commissioner of Patents:

✓ Erase all claims excepting 5 and 9 and insert:-

Sub P'

1- The method of attaching turbine blades to their carrier of relatively great mass, which consists in adjusting the heat capacity of localized areas of the carrier at the point of attachment, by ~~limiting the heat conduction~~ partially isolating from the remainder of the carrier ~~between these areas and the relatively great mass~~, so that a welding temperature may be reached notwithstanding the cooling effect of the mass of the carrier, and passing electric heating current directly through the carrier, and by way of clamps through the blades to weld the blades ^{in succession} successively to the carrier, substantially as described.

per J.

F

per I

per I

per J.

2- The method of attaching turbine blades to their rotor carrying element ~~and maintaining the balance of the rotor~~ consisting the equalizing the heat capacities of the welding parts by limiting the conducting areas of the carrier, at the points of blade attachment, symmetrically in relation to and enclosing the blade between clamps the axis of rotation of the rotor, so that on heating locally by the electric current the blade and carrier rise to approximately the same temperature and welding the blades to the carriers so prepared. -

Insert M³

At the end of the specification insert:-

F'

The electric heating current is passed directly through the carrier and by way of clamps through the blades. -

There is a clear difference between the method set forth in the above claim and that of Cowdery. In Cowdery the purpose is to prevent heating up and burning of the body of the rake. In de Ferranti's case, on the contrary, the purpose is to provide a way by which to oppose the cooling tendency, due to the heat conducting capacity of the larger mass of metal to which the comparatively small blades are to be welded.

Cowdery's problem was to prevent burning up the body of the rake. de Ferranti's problem was to get sufficient heat at the attaching points of the blades, notwithstanding the tendency of the heat to be dissipated throughout the larger mass.

Cowdery in his method provided clamps for holding the body of the rake to keep it out of the heating circuit.

Applicant does not employ clamps for the carrier, but passes the current directly through the larger mass of metal, and he limits the conduction of heat between the attaching point or area for the blade and said larger mass so that a sufficiently high temperature for welding purposes will be secured at the point of contact.

It is submitted that the problem to be dealt with by applicant arose because of the requirements and conditions of this particular art, i.e. that of making bladed carriers for turbines and although applicant is to be charged with the knowledge of the Cowdery patent it is not thought that this knowledge would suggest the present method.

Applicant was not facing the problem of preventing the carrier from burning, as its comparatively great mass in relation to the blades rendered this impossible, but he had to provide means of preventing the rapid cooling tendency of the larger mass from dissipating the heat away from the attaching points or areas and thus preventing a good weld.

Furthermore, it has been the practice heretofore in attaching blades to rotors, to calk them in place, or to hold them by filling pieces together with calking. As a result of this method, and owing to inequalities, it has been necessary to balance the rotors by boring cavities therein at various places and filling the same with lead, a process requiring skilled labor and the expenditure of considerable time. With my present process in which the limited conducting areas of the carrier are disposed symmetrically in relation to the axis of rotation, and in which the blades are welded to these symmetrically disposed areas, the rotor as it comes from the welding process requires no special balancing. Applicant has thus produced an advance in the art of making rotors for turbines and one not suggested in any way by the Cowdery patent. If any advantage results from applicant's process in this specific art, it is thought he should have protection on the advance which he has made.

Applicant reserves the right to file a divisional application for the article.

Respectfully,

S. Z. de Ferranti,

By-

Spear Middleton Donaldson & Spear

Attys.

April 18, 1907.

Div. 13 Rm 329

2-260

"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

Paper No. 15. Rej.
All communications respecting this
application should give the serial number,
date of filing, title of invention, and
name of the applicant.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

Serial No. 208035

WASHINGTON, D. C., June 4, 1907.

MAILED

Sebastian Z. de Warranti.

C/o Spear Middleton, Donaldson & Spear,
Washington, D. C.

Please find below a communication from the EXAMINER in charge of ^{your} ~~the~~ application of
#208,035, filed May 14, 1904, for "process & Apparatus for Electrically
Welding Turbine Blades to their Carrying Element".

E. B. Moore.

Commissioner of Patents.

Responding to amendment filed April 19, 1907.

Claims 1 and 2 are rejected as being unpatentable over
Cowdery, of record, and Eyre, also of record, in view of Moxham,
#496,890, May 19, 1893, (219-10). In claim 2 applicant has included
as an element "maintaining the balance of the rotor"; this phrase merely
states what is the result of the process, rather than aiding in defining
the process.

Claims 3 and 4 stand allowed.

E. A. P.

E. D. Sewall

Examiner, Division 13.

1000
APPLICATION ROOM
MAY 9 1908
U.S. PATENT OFFICE

U.S. PATENT OFFICE,
MAY 13 1908
DIV. 13.

Serial No. 208
Paper No.

Room 302

G. Z. de Ferranti

Filed May 9, 1908

Process and apparatus for electrically welding turbine blades to their carrying elements.

Filed May 14th 1904.

Serial No. 208034.

To the Commissioner of Patents:

✓ Erase "and apparatus" from the title of the specification.

✓ Insert at the end of the specification.

"By means of my invention it will be seen that the blades are attached to their carrying elements in an expeditious and efficient manner while in the case of rotors a still further advantage is obtained over the methods of blading commonly employed inasmuch as it properly carried out the attachment of the blades by electric welding introduces no change of symmetry with respect to the axis of rotation and consequently dispenses with the tedious operation of balancing otherwise rendered necessary."

With respect to the rejection by the Examiner of claims 1 and 2, applicant respectfully submits the following in support of their patentability. First with regard to Cowdery's specification applicant would point out that Cowdery's specification should be considered totally apart from any knowledge subsequently acquired from applicant's specification and the test applied whether a skilled workman with Cowdery's specification as the state of knowledge in the art could evolve the applicant's process without exercise of the inventive faculties. That information then would such a person obtain from Cowdery's specification? Would it be sufficient to teach the public how to perform the applicant's

process? In the first place, the problems in question are entirely different. Cowdery seeks to avoid the occurrence of a high temperature for fear of burning the parts concerned; applicant on the other hand and in direct opposition to this seeks to secure a temperature in the carrier high enough for welding. Cowdery, in other words gets too much heat; applicant cannot get enough in the carrier or if he can runs the risk of burning the small blades. Applicant's solution of the problem consists in two parts:- (a) partially isolating a part of the carrier by grooves and the like to prevent rapid conduction of heat away from the welding point by limiting the available cross sectional area and (b) artificially increasing the mass of the blade being welded by clamping it between copper jaws of large heat capacity and leading the current not directly to the blade but by way of the clamps. There is thus a contrast in the manner of treating the carrier and the blade; current is led directly to the partially isolated portion of the carrier but only indirectly to the blade by way of the heavy copper clamps which enclose the whole of the blade with the exception of the extreme tip. The carrier is thus compelled to rise to the welding temperature while the blade is prevented from burning. Or put differently the very large ^{mass} ~~mass~~ of the carrier and the very small mass of the blade rise in temperature at approximately the same rate. To secure this result has been \pm Applicant's outstanding difficulty throughout and it is only achieved by a differential treatment of the parts to be welded.

Cowdery's specification is ambiguous on many

points but there is clearly no suggestion of the differential mode of leading current to the welding point now emphasised in applicant's claim 1. Neither is there in Moxham of record. In each case this is explained by the fact that neither Cowdery nor of Moxham was contemplating the welding together ~~by~~ two parts differing to any considerable extent as regards mass and heat capacity while applicant on the contrary deals directly with such a case.

Turning to claim 2, the point is made of maintaining the balance of the rotor by cutting the grooves, recesses or the like "symmetrically in relative to the axis of rotation of the rotor". It appears indisputable that no such suggestion is made by either Cowdery or Moxham.

For the above reasons it is requested that claims 1 and 2 as they now stand may be reconsidered.

Respectfully,

S. Z. de Ferranti,

By Spear Middleton Donaldson & Spear

Attys.

H.H. 3.

A.M.

Div. 13 B 329

2-260

Address:
"The Commissioner of Patents,
Washington, D. C."
and not any official by name.

Paper No. 17-Reg.
All communications respecting this
application should give the serial number,
date of filing, title of invention, and
name of the applicant.

D

DEPARTMENT OF THE INTERIOR

Serial No. 208034

AEW

UNITED STATES PATENT OFFICE

WASHINGTON

June 5, 1908.

MAILED

Sebastian Z. de Ferranti,

C/o Spear, Middleton, Donaldson & Spear,

Washington, D. C.

Please find below a communication from the EXAMINER in charge of ^{your} ~~the~~ application of

#208,034, filed May 14, 1904, for "process for Electrically Welding
Turbine Blades to their Carrying Elements".

E. B. Moore.

Thomas A. Moore
Commissioner of Patents.

Responding to amendment filed May 9, 1908.

The action with respect to claims 1 and 2 is believed to be correct, and is adhered to. To the formation of the carrier in a certain way it is considered immaterial/ ^{whether} ~~whether~~ the electric heating means is connected directly to the carrier, and to the blades or by some other means, by clamps/, and therefore these elements, it is considered, do not aid in conferring patentability to the claims. It is true that Cowdery, of record seeks to avoid the occurrence of high temperature, for fear of burning the parts concerned, but it is considered that he does substantially the same thing that applicant does, and for the same purpose, only stated in a different way. Cowdery makes one part smaller at a certain portion, so that he can heat the reduced part to a welding heat in the same time that the other part to be connected thereto is heated to a welding heat, and in both the case of Cowdery and of applicant the same difficulty is encountered, namely, heating a relatively large part to a welding heat at a certain point in the same time that a smaller part is heated to the same temperature. Cowdery has solved the problem how to do this.

Attention is called to Rule 50, which requires that the drawings show every feature of the invention covered by the claims. There is nothing in the drawings of this application which shows the clamping means or the connections between the electric heating means and the elements to be welded.

E. A. P.

E. D. Sewall

Examiner, Division 13.

1226

APPLICATION ROOM
APR 30 1909
U.S. PATENT OFFICE

~~U.S. Patent Office,
MAY 3 1909
Division XVIII.~~

Serial No. 208,034
Paper No. 18
Amendment H

Room 382,
S. Z. de Ferranti
Bladed Turbine Element and Process for the manufacture
thereof.
Filed May 14th, 1904.
Serial No. 208034.

To the Commissioner of Patents.

Reply to Office action of June 5th, 1908.

Sir,

Reply to Official action of June 5th 1908.

✓ Change title to "Bladed turbine element and
process for the manufacture thereof".

✓ Page 3, at end of line 8, insert the word "and",
and between lines 8 and 9 insert as a new line:-

H' "Figs. 12 and 13 show a form of clamp and a
diagram of the electrical connections".

✓ Page 5, between lines 17 and 18 insert as
a new paragraph:-

H2 "In every case it will be seen that those portions
of the carrier to which the blades are to be welded
are partially isolated from the body of the carrier
by slots, holes and so forth so as to limit the
cross-sectional area available for the conduction
of heat, and so compel the carrier to rise to the
welding temperature. On the other hand to prevent
the blades being burnt away, their mass is artificially
increased by holding them between clamps or jaws of
high heat conductive material such as copper.

Thus referring to figures 12 and 13, the jaw holder
63, is separated into two branches by means of the
slot, 64, each branch carrying a copper jaw, 65,
shaped so as to clear adjacent blades. Between

1237
the jaws, 65, the blade to be welded is clamped, so as to leave the tip only exposed as seen in figure 13, and in order to ensure a good contact and rigid holding of the blade in the jaws, a clamping device is preferably arranged in addition to that provided by the spring of the two branches of the jawholder.

According to the form shown links, 66, are pivoted at 67, to one branch of the jaw holder, while short cross links, 68, connect the links, 66, to the other branch to which they are pivoted at 69. The long links, 66, are curved as shown, and are connected at their non-pivoted ends by the cross-piece, 70, to which pressure to clamp the blade is applied in the direction of the arrow (see figure 13) by means of the cam, 71, and the hand lever, 72, both of which are secured to a common axle rotatably mounted on any convenient support, 73. A spring such as 74, serves to return the links when the blade is released.

The necessary electrical connections to affect the welding are shown diagrammatically on figure 13, in which G, represents an appropriate source of alternating current, and T, a transformer. It will be seen that while the lead, t¹, may be connected directly to the carrier a, as in the example shown, it is necessary on the other hand that current to the blade, d, should be conveyed indirectly by way of the jaw holder, 63, and lead, t²."

1238 ✓

.Insert the following as new claims:-

H3 3. Process for the attachment of turbine blades to their carriers consisting in partially isolating those portions of the carrier in the neighbourhood of the points of attachment of the blades, to limit the cross-sectional area available for the conduction of heat therefrom; artificially increasing the volume of the blades by contacting them with metal masses of high heat conductive capacity and finally welding together the carriers and blades so prepared.

per I. ~~4. Process for the attachment of turbine blades to their carriers consisting in partially isolating those portions of the carrier in the neighbourhood of the points of attachment of the blades, to limit the cross-sectional area available for the conduction of heat therefrom; artificially increasing the volume of the blades by contacting them with metal masses of high heat conductive capacity, and finally welding together the carriers and blades so prepared by passing electric current to the blades by way of said metal masses.~~

per J. ~~4. -5. Process for the attachment of turbine blades to their carriers consisting in partially isolating those portions of the carrier in the neighbourhood of the points of the attachment of the blades, to limit the cross-sectional area available for the conduction of heat therefrom; artificially increasing the volume of the blades by clamping them between metal masses of high heat conductive capacity so that the tip of the blade only is exposed and finally welding together the carriers and blades so prepared.~~

✓ Change claims Nos. 3 and 4, to 6 and 7
respectively, and insert the following as new
claims:-

per J. 7. ~~8.~~ A bladed turbine element having partially
isolated portions and blades welded thereto.

H⁴ 8. ~~9.~~ A bladed turbine element comprising in
combination a blade-carrying element having circum-
ferential grooves with intervening projecting rings
of metal formed thereon, and uniformly spaced blades
welded to said projecting rings.

9. ~~10.~~ A bladed turbine element comprising in
combination a blade-carrying element having a
portion of uniform curvature and blades welded thereto,
said blades being disposed at equal distances
from the centre of said uniform curvature.

10. ~~11.~~ A bladed turbine element comprising in
combination a blade-carrying element having an
axis of symmetry and blades welded thereto in
positions symmetrically disposed about said axis.

Insert I: Attention is respectfully drawn to the fact that
the present application was originally filed in
combination with application Serial No. 236048, which
has since matured into patent No. 911222. Applicant
therefore respectfully requests permission to reinsert
the figures and corresponding description of the
blade clamp originally on file, but cut out
subsequently when dividing the application.

A new sheet of drawings is filed herewith to
be made of record. The process claims which at
present stand rejected, applicant proposes to appeal
in due course and takes no further action in relation

to them for the present.

With regard to the three new process claims filed herewith, applicant believes that these have points of novelty over anything shown in the references.

To sum up the position shortly once again, applicant has met with two difficulties ⁱⁿ ~~the~~ welding turbine blades to their carrying elements:-

(a) On account of the large volume of the carrier, the heat is conducted away from the welding spot so quickly that the required temperature cannot be reached, while

(b) the small mass of metal in the blades renders them peculiarly liable to be overheated and burnt.

These difficulties are overcome respectively by partially isolating appropriate portions of the carrier to ensure the temperature of these parts rising to the required degree, while on the other hand artificially increasing the mass of the blades by putting them into good electrical contact with suitable masses of copper or other high conductive material, the current being led to the blade by way of these metal masses.

This artificial increase of the mass of the blades is a vital and essential part of applicant's process since in this way alone can the delicate blades be kept sufficiently cool. The blade carrier and the blades have thus to be treated differentially. The carrier must be assisted to rise to the required welding temperature, while the blade must be assisted to keep sufficiently cool. It is

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believed that this opposite differential treatment
of carrier and blade for a specific purpose is not
to be found in any of the references cited.

A careful reconsideration of the case as
amended is respectfully solicited.

Respectfully,

S. A. de Ferranti

By

Spear Middleton, Donaldson & Spear

Attorneys.

HHG/LW.

1244

APPLICATION ROOM
DEC 8 1909
U.S. PATENT OFFICE

Serial No. 208034
Paper No. 20
Amendment I and Sketch

Room 329
Sebastian Z. de Ferranti
Serial No. 208034
Filed May 14th, 1904
Process for electrically welding turbine blades to
their carrying elements.

To the Commissioner of Patents.

Sir,

This amendment is in reply to the Official
letter of May 24th, 1909. A new oath is filed
herewith.

not entd
See Examiners
letters
also Amend F.

✓ Page 2, line 31,

✓ Page 3, lines 2 and 7,

✓ Change "scrap" to "partial"

Insert figures 12 and 13 filed with the last
amendment.

Page 2, line 20, insert "Figure 4a shows an
elevation of the carrier shown in figure 4".

✓ Claim 1, line 9, change "successively" into
"in succession".

✓ Claim 2, lines 2 and 3 erase " and maintaining
the balance of the rotary".

✓ Claim 7, line ⁵ 4, erase "at least"

✓ line 5, erase "two" and insert
therefor "certain".

With regard to claims 1, 3 and 5 which the
Examiner has objected to upon Cowderay, Eyre and
Moxham, the applicant would very respectfully point
out that none of these specifications disclose the
applicant's process.

Taking for example Cowdrey's specification, it appears to the applicant that a different construction would be given to the language used by the Cowdrey specification by persons who had not seen the applicant's process, and by persons who were familiar therewith. The article which Cowdrey proposes to manufacture is one involving no special difficulties with regard to welding, as it is obvious to anyone skilled in the art that by forming slight projections on the back of the rake for welding the fork thereto the necessity of heating up the whole of the head of the rake would be dispensed with. Cowdrey in fact wished to protect the points of his rake from the deleterious action which would result from being heated up to the welding temperature; he consequently resorts to a method which is very well understood in the art, and by making a slight projection on the back of the rake he welds the fork thereto.

In this specification the problem is not presented of welding an article like a turbine blade on to a blade-carrying element, the blade-carrying element being generally of much greater mass than the turbine blade, and it is respectfully submitted that Cowdrey's specification would not materially assist any person who had the above problem to solve.

What the applicant does is to partially isolate the parts of the carrier upon which the blades are to be welded, and in addition thereto hold the blade in such a way as to artificially increase its heat capacity, or in other words, the heat capacity of the smaller mass is augmented while the heat capacity at the point where the blade is welded on

to the larger mass is reduced so as to allow the welding operation to be performed as efficiently as possible. Cowdrey's specification does certainly not disclose a method of increasing the smaller part to be welded, and unless an exceedingly strained interpretation can be put upon the language which he uses, in the applicant's opinion he does not disclose a method of welding together parts of ^a dissimilar mass by reducing the heat capacity of the latter. Cowdrey's process is simply one which would be chosen for convenience by blacksmith if he has faced the problem of welding a fork to the head of a rake, such as Cowdrey wishes to manufacture by employing one of the very well known methods in the art. The applicant, however, had a much more difficult problem to solve, and not only were the masses so very dissimilar but the difficulties for obtaining a good weld were infinitely more than in the case with Cowdrey's specification.

With regard to Moxham's specification it is submitted that the two pieces to be welded here are of practically the same mass as one another, and consequently no difficulty is experienced, unless the difficulty which Moxham provides for by isolating part of one of the members in order to localise the heat supplied by the passage of current therethrough, as if the whole cross section of the rail were to be welded at once the current required would be enormous.

Kyre's specification discloses the form of welding machine, but as the applicant does not claim,

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a machine for performing the operation of welding but a process, it is submitted that beyond disclosing a machine for electric welding Eyre has very little bearing upon the applicant's process.

The applicant therefore submits that the process which he has disclosed in claims 1, 3 and 5 are not found in either of the specifications which the Examiner has cited, either individually or collectively as no person skilled in the art, from a perusal of these specifications would be put in possession of the applicant's process without exercise of the inventive faculties.

In view of the above these 3 claims are respectfully resubmitted for the Examiner's consideration.

✓ Cancel claim 4.

With regard to claim 2, which the Examiner has rejected on Cowdery and Moxham, the applicant would refer him to what has been said above with respect to claims 1, 3 and 5.

✓ Re-number claims 5 to 11 as 4 to 10.

With regard to claim 7 which the Examiner has rejected on De Laval of record taken with either Cowdery and Moxham, the applicant would point out that in this claim he has set forth a turbine element having partially isolated portions and blades welded thereto. In neither of the specifications cited by the Examiner against this claim is a turbine blade element disclosed at all having the blades welded to the carrier, as in De Laval's specification the applicant is unable to discover how the blades are formed, and from the appearance in the drawings

he concluded that they are formed integrally with the carrier.

With regard to claims 8 and 9, which are rejected as not being patentable over allowed claim 7, the applicant cannot agree with his view, as the differentiating feature of uniformly spaced blades welding to the carrying element appears to him to be a sufficient differentiation from claim 6.

With regard to claim 10 the applicant can here only repeat what he has said with regard to claim 7, that De Laval discloses no turbine element having the blades welded thereto, and consequently he does not consider that De Laval's patent is in any way a disclosure of the blade element shown in the applicant's specification.

In view of the above remarks it is respectfully requested that the Examiner will reconsider the case and the applicant hopes that it will soon be passed to an early allowance.

Insert new figure 4a filed herewith and the following claims:-

I'
per J

11. A process for electrically welding masses of dissimilar cross-section of conductivities consisting in equalising the heat capacities of the masses in the vicinity of the welding spot and passing current through the point of contact of said masses.

12. Process of electrically welding masses of dissimilar cross-section of conductivities consisting in reducing the heat capacity of a mass of greater conductivity, increasing the heat capacity of the mass of lesser conductivity and

passing current through the point of contact of said
wires.

1219

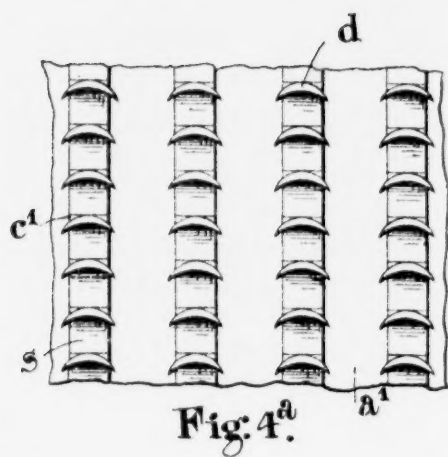
Respectfully,

Sebastian Z. de Ferranti

By

Spear, Middleton Donaldson & Spear
attorneys.

VB/LW.



1351

Div. 13 ROOM 329

2-260

PAPER NO. 21

The Commissioner of Patents,
Washington, D. C.

Communications respecting this
application should give the serial number,
date of filing, and title of invention.

BAP

AEW

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
WASHINGTON

Jan. 14, 1910.

Sebastian Z. de Ferranti,
c/o Spear, Middleton, Donaldson & Spear,
Washington, D.C.

Please find below a communication from the EXAMINER in charge of ~~the~~ application, ~~XX~~
#208,034, filed May 14, 1904, for "Process for Electrically Welding
Turbine Blades to their Carrying Elements".

E. B. Moore

Commissioner of Patents.

Responding to amendment filed Dec. 3, 1909.

The oath referred to in the first paragraph of the above
amendment has not been received.

Figures 12 and 13 were not filed with the last amendment, and
therefore can not be entered, as directed in lines 7 and 8 of page 1
of the amendment.

The brief description of figure 4^a has not been entered in
line 20 of page 2, as the place in said line where the same should be
entered has not been designated. The entry of new figure 4^a is refused,
as it does not appear to be necessary in order to make clear the inven-
tion claimed and is held to involve new matter.

Claims 1 to 4 are rejected as of record. The patent to
Cowdery alone is considered to anticipate the claims. The rake parts
in Cowdery are electrically welded and held by clamps, and these clamps
will cause a material increase of the part having the relatively small
mass of metal. Is not the heat conduction limited by making a project-
ing portion comparatively small relative to the rest of its surrounded
portion? If so, claim 1 should bring this out. This, however, will
not aid in conferring patentability to the claim. The steps set forth
in claims 3 and 4 are not all shown, namely, the increasing the volume
of the blades.

de Verranti, #208,034--2.

Claim 5 stands allowed, and also claim 6, subject to an amendment in next to the last line which will bring out the fact that each of the blades is welded to a plurality of the rings. As the claim was amended, it does not bring out this feature so as to bring out the utility of the projecting rings.

Claim 7, and also claims 9 and 10 are rejected on the ground that they are directed to the same invention as that for which applicant has already received a patent, namely, de Verranti, #274,398, De. 24, 1907.

Claim 8 is rejected as not patentably different from that allowed in claim 6 (former 7), especially in view of De Laval, of record, which shows that it is old to have the blades "spaced uniformly"

Claims 11 and 12 are required to be canceled, as they are for a process of electrically welding metals, examinable in another division of the office, in the same class as Lachman, #923,128, May 25, 1909, and Moxham, #497,808, May 23, 1893, (219-10), and they are for an independent invention from that for which claims have been prosecuted before the office (see ex parte Belle, 110).C., 1728).

E.A.P.

G.A. Nixon .

Examiner, Division 13.

1235
APPLICATION ROOM
MAR 14 1910
U.S. PATENT OFFICE

RECEIVED
MAR 15 1910
Division 13, Paper No. 22
Amendment J & Oath.

Room 329
S. Z. de Ferranti
Serial No. 208034.
Filed May 14th, 1904.
Process for electrically welding turbine
blades to their carrying elements.

To the Commissioner of Patents.

Sir,

This amendment is in reply to the Official
action of January 4th, 1910.

✓ A new Oath is filed herewith.

With regard to figures 12 and 13, the applicant
believes that the hand-made drawing of these
figures was filed with the amendment replying to
the Office action of June 5th, 1908, and applicant
would esteem it a favour if the Examiner would
kindly ascertain whether the drawing has not been
mislaid by the Office.

✓ Cancel brief description with regard to
figure 4^a directed to be entered on page 2, line 20.

never been
added. → Cancel figure 4^a.

The above figure was prepared in accordance
with the Examiner's requirements as expressed in the
Official letter of May 24th, 1909. As, however, the
Examiner considers it now to be superfluous, the
applicant has decided to withdraw this figure.

✓ Claim 1, line 4, erase "limiting the heat
conduction"

✓ Line 5, erase "between" and insert therefor
"partially isolating"

✓ Line 5, erase "and relatively great mass" and
insert therefor "from the remainder of the carrier"

✓ Claim 2, line 6, after "rotor" insert "and enclosing the blade between clamps"

✓ Erase claim 4.

With regard to these claims it is respectfully submitted that as now drafted they clearly differentiate the applicant's invention from that of Cowdery of record.

In the first place the applicant would point out that the arts of rake-making and turbine construction are not in any way allied to one another, so that even if the applicant's invention had been partially disclosed in an invention with regard to rakes, it could hardly be fair that a turbine constructor, now that the art has assumed such huge proportions, should be chargeable with the knowledge of an art so distantly related to the one upon which he is engaged.

In the second place, the applicant would point out that the problem which was presented for his solution in connection with the blading of rotors or stators in turbine manufacture, was not in any way analagous to that with which Cowdery was faced in making his rake. In the first place the cross-section of both parts of Cowdery's rake are practically identical, as the bar upon which the teeth are formed is of the same cross-section as the fork carrying the handle. The only interpretation which can be put upon the language used by Cowdery consistent with his disclosure appears to be, that the part carrying the teeth of the rake and the part carrying the fork were primarily raised to the welding temperature by the

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electric current before being pressed together and welded. This is apparent and indisputable from the terminology used in lines 56 and 57 of Cowdery's specification.

Now, any construction put upon the present specification involving knowledge of the art developed after the date of Cowdery, would appear to be contrary to all the canons of construction in construing patent specifications. It must also be remembered that Cowdery's specification was filed in the year 1891, so that it cannot be presumed that the problem to be solved in connection with the union of parts by electric welding was too well understood. Further, Cowdery's description is very meagre and no diagram of the circuits proposed, or any full directions with regard to the same has been given in his specification.

Had Cowdery shown the method in which he intended to apply the electric current for the purposes of uniting the parts together, then there would be no room for argument, but as his specification must be construed in the light of knowledge available at the date of his application, and as the construction of his specification points to a totally different process from that which the applicant uses, the disclosure in Cowdery ought not to be strained in order to prevent the applicant from obtaining protection for an invention which must be admitted is of paramount commercial importance.

The problem which the applicant had to solve was that of welding a blade to a rotor or other part of a turbine. It is well known that the blades involved are of exceedingly small mass in

comparison with that of the rotor, so that if the end of the blade were pressed against the rotor without any initial ^{proportioning} ~~proportion~~ of its surface at the welding point, then the only result would be burning away from the blade. The applicant, however, in the course of his experiments and investigations foresaw that if an efficient weld was to be obtained then it was necessary that both parts involved should rise to the welding temperature. This result he was enabled to obtain, by partially isolating the welding part upon the larger mass, and as this partial isolation prevented the flow of heat from welding point by conduction, he was thus enabled to obtain an exceedingly good weld between the blade and the part carrying the same. In fact, so strong is the weld obtained by applicant's process, that the blades can be hammered over at right angles without the weld giving way.

In view of the fact that the present methods of fastening blades are exceedingly crude, and reliance is placed upon ^{caulking} ~~cooking~~ and ^{other} ~~such~~ old-fashioned methods of obtaining rigidity, it will be evident that the idea of forming the blades separately from the rotor while uniting them thereto in such a manner that they may be said to be practically integral therewith, is an invention of the highest importance. To an unprejudiced mind, such an advance in the art of turbine construction is one possessing great merit, and obviously the person introducing or inventing the same ought to have protection for his invention. Further, the applicant obtains this satisfactory weld not by clamping both pieces as is

1237

done by Cowdery, but by differential treatment of the parts concerned in order to obtain the efficient result. As the conductivity of the larger mass such as the rotor, is so great that the heat is conducted rapidly away from the welding point, it was necessary that some means should be devised for retarding this flow of heat and localizing it, so that the necessary temperature may be obtained. This, as has been stated above, was effected by the applicant by the partial isolation of the welded parts of the rotor, but when it comes to the treatment of the blade, the applicant increases its mass artificially by enclosing the blade with the exception of its tip in the clamping edges. By this means, it will be evident that the conductivities as regards heat of the two parts can be practically balanced, so that both portions will rise to the welding temperature at the same time. On the application of pressure interpenetration of the parts is effected, and an exceedingly good weld obtained of the blade to its carrying element.

The turbine constructor in search of a method of fastening the blades onto the rotor or stator as the case may be, could hardly be presumed to find in Cowdery the information with directions necessary to enable him to carry out the applicant's process, and in view of this fact as well as the fact of the extreme utility of the applicant's invention, it is hoped that the Examiner will now withdraw his rejection to these claims.

✓ Re-number claims 5 and 6 as 4 and 5.

Claim 4, line 4, erase "of at least"

Sub K'

line 5, erase "two" and insert therefor
"to a plurality"

Claim 5, line 5, after "to" insert " a plur-
ality of"

✓ Cancel claims 7, 8, 9, 10, 11, and 12.

An early allowance of the case is respectfully
solicited.

Respectfully

S.Z. de Ferranti

By

Spear, Middleton, Donaldson & Spear
Attorneys.

WB/LW

APPLICATION ROOM
MAR 14 1910
U.S. PATENT OFFICE

re UNITED STATES Patent application No. 208034 filed
14th May 1904, for "Process for electrically welding
turbine blades to their carrying elements".

O A T H.

AMERICAN CONSULATE.
SHEFFIELD, England

33:

Sebastian Ziani de Ferranti, the above named petitioner being sworn, deposes and says that he is a subject of the King of Great Britain and Ireland, and resident of Grindleford Bridge, Sheffield, in the County of York, England, (late of 31, Lyndhurst Road, Hampstead, London, N.W., England), that he verily believes himself to be the original first and sole inventor of the "Process for electrically welding turbine blades to their carrying elements" described and claimed in the ~~xxxxxx~~ specification to his application serial No. 208034 filed 14th May 1904; that he does not know and does not believe that the same was ever known or used before his invention or discovery thereof, or patented or described in any printed publication in any country before his invention or discovery thereof or more than two years prior to this application, or patented in any country foreign to the United States on an application filed more than twelve months before this application, or in public use or on sale in the United States for more than two years prior to this application and that no application for Patent on said improvement has been filed by him or his representatives or assigns in any country foreign to the United States, except as follows:-

1260

Foreign
Fee
Stamp

Great Britain, No. 11921/03 filed 25.5.1903.
AUSTRIA, application filed 20.5.1904.
GERMANY, application filed 21.5.1904.
BELGIUM, application filed 26.5.1904.
HUNGARY, application filed 26.5.1904.
FRANCE, application filed 31.5.1904.
RUSSIA, application filed 27/4.10/5.1905.
CANADA, application filed 23.5.1905.
JAPAN, application filed 9.6.1905.
ITALY, application filed 27.7.1905.

C.N.D. Sworn to and subscribed by Sebastian Ziani de Ferranti for me, this 3d day of March 1910

Chas. N. Daniels

Consul of the United States of America.
Sheffield, England.

SEAL

APPLICATION ROOM
APR 14 1910
U.S. PATENT OFFICE

1261
RECEIVED
APR 18 1910
Division 13, Paper No. 23
Amendment K.

Room 107.

S. Z. de Ferranti.

Process and Apparatus for Electrically

Welding Turbine Blades to their

Carrying Elements.

Filed May 14/04.

#208,034.

To the Commissioner of Patents:

✓ Cancel lines 2 to 6 page 6 of amendment filed March
14th and substitute:-

✓ Claim 4 lines 8 and 9 cancel "the blades to said car-
riers so prepared" and insert - each blade to a plurality of
said rings -

✓ Claim 5 line 5 after "rings" insert - each blade being
welded to a plurality of rings -.

Respectfully,

S. Z. de Ferranti,

By-

Spear, Middleton, Donaldson & Spear.

Attys.

April 14, 1910.

12652

Div. 13 ROOM 329

2-260

Paper No. 24

Address only
"The Commissioner of Patents,
Washington, D. C."
and not any official by name.

All communications respecting this
application should give the serial number,
date of filing, title of invention, and
name of the applicant.

DEPARTMENT OF THE INTERIOR

AEV

UNITED STATES PATENT OFFICE

WASHINGTON D.C. Apr. 26, 1910.

MAILED

Sebastian Z. de Ferranti,

c/o Spear, Middleton, Donaldson & Spear,

Washington, D.C.

Please find below a communication from the EXAMINER in charge of ^{your} application of

#208,034, filed May 14, 1904, for "Process for Electrically Welding

Turbine Blades to Their Carrying Elements".

E. P. Moore;

[Signature]
Commissioner of Patents.

*6-2611

Responding to amendments filed Mar. 14 and Apr. 14, 1910.

Applicant's argument has been fully considered, and action
on the claims taken as follows:

Claim 1, 2 and 3 are each rejected on Coudery, taken with
Eyre, of record.

Claim 4 (formerly considered allowable) is now believed to
be met in the above references, and it is rejected on Coudery taken with
Eyre.

Claim 5 is allowable.

In view of the fact that the examiner is satisfied that no
patentable process is disclosed in this application, this action may
be taken as final for purposes of appeal, if applicant so desire.

H.B.

G.A. Nixon

Examiner, Division 13.

APPLICATION ROOM
JUN 28 1910
U.S. PATENT OFFICE

1283
RECEIVED
JUN 27 1910
Division 13, Paper No.25
Amendment I

Room 329
J. E. de Ferranti.
"Turbine Blade Welding".
Filed May 14th, 1904.
Serial No. 202,034.

To the Commissioner of Patents.

Sir,

Reply to Office Letter dated April 26th, 1910.

It is very much regretted by Applicant and his Attorneys that the Examiner after having allowed claim 4 some twelve times or so during the last six years should now change his opinion and reject it. Neither are the reasons for such rejection understood, since Eyre of record does not appear to bear on the point covered in any way at all. The whole of Applicant's difficulties arise from the large mass of the carrier contrasted with the small mass of the blade. Circumferential grooving of the carrier has proved to be one good way of overcoming this difficulty. It is very respectfully pointed out that the problem above set forth never presented itself to Eyre since the bars he welds together are of equal cross section; neither is grooving of any kind employed by him.

Applicant, moreover, ventures to doubt whether even in the year 1910, the art of examining claims has reached a degree of precision sufficiently high to enable any distinction to be drawn between the patentability of the process and article respectively claimed in claims 4 and 5.

In this view he believes he is supported by

the opinion of the Examiner himself as expressed in the Office letter of December 16th, 1905.

The following statement appears therein:-

"Whether the invention is in the process or the article may be somewhat doubtful and for that reason it is believed to be proper to allow both claims in the same application."

For the above reasons, claim 4 is very respectfully resubmitted for reconsideration.

Claims 1 and 3 are also respectfully resubmitted on the ground that in order to meet the peculiar difficulties of the turbine blade welding problem, carrier and blade have to be treated differentially, the former having to have its mass produced and the latter having to have its mass virtually increased as by the copper blade clamps. No such differential treatment is to be found in any of the references.

Claim 2 is likewise resubmitted on the ground that the method of producing a bladed turbine rotor therein set forth is simple and less expensive than any hitherto practised inasmuch as the symmetry of the rotor being maintained throughout, the final step of balancing with lead can be successfully admitted. This advantageous omission arises solely from Applicant's novel process.

The feature of "symmetry" set forth in the preceding paragraph is indeed believed by applicant to be of such great practical importance that he requests that the following two claims dealing specifically with this point may be made of record:

It may be remarked parenthetically that it is

1255

believed that claims on these lines were favourably entertained by the Examiner in an oral interview in the Spring of 1907 or thereabouts, but through some mischance, such claims do not appear to have been definitely submitted for action on the merits.

5. The method herein described of constructing a turbine wheel, ring or drum, the same consisting first in forming said wheel symmetrically in relation to its centre of rotation with the parts next to the welding points reduced to properly conform to the volume of the blades and electrically welding said blades at the said points whereby the symmetry of the wheel is maintained.

7. A turbine wheel, drum or ring having a periphery made to conform to the volume of the blades at the points of attachment of said blades and symmetrical in relation to the centre of rotation and a series of blades of uniform dimensions welded symmetrically to a plurality of said points, substantially as described.

Very Respectfully,

S. Z. de Ferranti,

By

Spear, Middleton, Donaldson & Spear.

ATTORNEYS.

HMG/LW.

1-2136

DIV. 13, FORM 139

2-260

Paper No. 26

The Commissioner of Patents,
Washington, D. C.,
and not any other office.

All communications respecting this
application should give the serial number,
date of filing, title of invention, and
name of the applicant.

HP

DEPARTMENT OF THE INTERIOR

REV

UNITED STATES PATENT OFFICE

WASHINGTON, D.C. July 23, 1910.

MAILED.

Sebastian T. de Ferranti,

C/o Spear, Middleton, Donaldson & Spear,
Washington, D.C.

Please find below a communication from the EXAMINER in charge of ^{your} ~~the~~ application ^{YOUR} X

308,034, filed May 14, 1904, for "Process for Electrically Welding
Turbine Blades to their Carrying Elements".

E. R. Moore,

Commissioner of Patents.

2-260

Responding to amendment filed June 25, 1910.

In specific reply to applicant's comment on the Eyre patent, it will be stated that this patent was cited to show the use of clamps which can not help but perform the same function as applicant's clamps which hold the turbine blades. In further consideration of this patent, in the middle of page 2 of the above amendment, applicant states that "no such differential treatment is to be found in any of the references. If in the Eyre device one of the pieces to be welded were so large that no clamp would be necessary, the other clamp would perform the function denied by applicant.

New claim 6 is rejected as drawn to an aggregation of the manner of forming the turbine wheel proper, and the specific method of attaching the blades. The examiner sees no reason for changing his action on the first four claims, and these are each rejected on Coudery taken with Eyre, of record.

Claim 6 and 7 are allowable.

H.B.

G.A. Nixon.

Examiner, Division 13,

1237

APPLICATION ROOM
DEC 6 1910
U.S. PATENT OFFICE

RECEIVED
DEC 6 1910
Division 13, Paper No. 27
Amendment. M & Appearance

Room 329.
S. Z. de Ferranti,
Process for electrically welding turbine blades to
their carrying elements.
Serial No. 208034.
Filed May 14th, 1904.

To the Commissioner of Patents.

Sir,

This amendment is in reply to the Official
letter of the 23rd July, 1910.

With regard to the specification of Eyre
which the Examiner has relied upon in conjunction
with Cowdery for the rejection of the applicant's
claims, it is pointed out that the Examiner has
evidently misunderstood the point of the applicant's
last argument. The applicant has stated "that no
such differential treatment is to be found in any
of the references." in page 2 of the amendment filed
June 25th, 1910, but the Examiner appears to think
that if one of the pieces to be welded in the Eyre
device was so large that no clamp would be necessary
the other clamp would perform the function ^{desired} ~~served~~ by
the applicant. To this the applicant would reply
that supposing one of the parts being welded by
the Eyre machine were so large as to render clamping
unnecessary, then the problem would be such that some
process similar to the applicant's would require
to be proposed in order to effect the welding of one
piece to the other. In Eyre's specification no
suggestion is made of the manner in which articles
differing largely in volume can be successfully
welded together, and throughout the whole of the
specification his attention is directed to the

welding together of practically identical pieces. The difficulty therefore, which Eyre encountered cannot be the same as the applicant's in which the whole problem was the manner in which a part of small volume like a turbine blade could be welded to a part of large volume, such as a rotor or stator. If welding were attempted as the Examiner suggests, by ^{employing} ~~applying~~ Eyre's machine, with one part in one clamp and the other part of such large dimensions as not to require a clamp, then ~~if-it-were-attempted-to-weld-them-together~~ it would be found that the large volume of the larger piece would prevent any weld being formed owing to the difficulty in raising the parts to the welding temperature. This in short, was the difficulty with which the applicant was faced, and he overcame this difficulty by reducing the cross-section of the mass of larger volume to substantially the same volume as the part to which it is to be welded.

There is no suggestion in the whole specification of Eyre of reducing the cross-section of one of the parts to be welded at all.

With regard to Cowdery's specification, the applicant would point out that here there is disclosed a process of electric welding, but this process although bearing a ^{resemblance to} ~~type-of~~ surface ~~resembling~~ the applicant's, in reality is not by any means so closely related as would seem at first sight. In the first place, the art to which Cowdery's specification relates, is that of making rakes, and the problem with which he was faced cannot be termed analogous to that with which the applicant was faced. Further, there is no suggestion in

Cowdery's specification that the heating effect of the current was due to the resistance at the contacting points of the two ^{parts} ~~points~~, while from a perusal of the specification it would appear that each of the pieces were individually clamped between electrodes, so that the ohmic resistance of the parts between the electrodes was responsible for the raising of the temperature. In support of this view, attention is directed to line 51, in which it is stated: "In electric welding, the two pieces to be welded are suitably clamped in the terminals of a circuit carrying a current of large volume," and then in line 56, where it is stated that "the meeting surfaces of the pieces which have been heated to the welding heat by the current," are brought against each other." The inference then is that before actual contact of the parts takes place, they have been raised to the welding temperature. Now the only possible way in which this could be done by electric welding is certainly not by leading the current across the point of contact of the two pieces to be welded, as in that case they would have been brought together before their temperature started to rise.

Cowdery's specification, then, in view of these two extracts which the Applicant has selected, points to a method of electric welding entirely different from that which applicant uses. ^{& claims} Also that it would appear that the applicant's process is novel in view of both Eyre and Cowdery's specifications.

Further, when Cowdery's article is considered it will be evident that he was not faced with the same difficulty as the applicant, because the rake of Cowdery is naturally formed with a cross-section

similar to the fork to which it is attached, and ~~that~~ there was no partial isolation of the parts necessary in order to reduce the volumes of the metal at the welding point.

Again, in each of the specifications of Eyre and Cowdery, the use of two clamps one for each part to be welded, is insisted upon. The applicant, however, only uses one clamp for the blade and does not use one at all for the turbine carrying element, in fact, the difficulty of applying the process or the machine shown in either Cowdery or Eyre's specification, would consist in the fact that only one of the parts could possibly be held in a clamp, so that the fact of the applicant using only one clamp while prevented from the nature of his process from using the other, differentiates it to a great extent from either test disclosed in Eyre or Cowdery's specifications.

When it is considered that the art of turbine making has advanced with such rapid strides, the necessity of ~~the~~ discovering some way of uniting the blades to the rotor in an effective manner, would be accounted of exceeding importance. It is well known that the present method of fastening the blades of turbines to their carrying elements is open to great improvement, as it is necessary to use caulking strips or some other antiquated means for holding the blades in position. The ideal method of fastening blades is obviously to arrange matters so that they will practically form an integral part of the rotor or stator. This advantage the applicant believed he has been the first to accomplish as by electrically welding the blades to the carrier in the way in which he has disclosed in his

1271

specification, a joint of great strength and efficiency is obtained. There is further not the slightest chance of the blades working loose during working of the turbine, as by means of his electric welding process, the applicant is enabled to fasten the blades to the rotor in such a manner that the blades may be bent over at right angles without in any way breaking or affecting the weld. When this fact is considered, it will be evident that the advantages of the applicant's process are very great.

To sum up the applicant's contention, Cowdery's specification he maintains does not show a process in which it is distinctly stated that the current is led across the point of contact of the two parts to be welded. Further, the arts of rake and turbine making are so far removed from one another that the ^{transformation} ~~transformers~~ of a process suitable for making rakes into a process suitable for welding the turbine blades to their carrying elements might well evolve invention. Again, Eyre's specification discloses an electric process in which the current is led across the points of contact of the two parts to be welded, but in this case there is no solution of the problem disclosed of welding a part of small mass to a part of a relatively greater mass by partially isolating the parts of the greater mass at the welding spot to approximately the cross-section of the part to be attached thereto. Consequently, even in full possession of the knowledge disclosed in both Eyre's and Cowdery's specification, the applicant maintains that a person skilled in the art could not obtain possession of the applicant's process without some

✓ Insert the following new claims:-

8. A process for uniting two parts together consisting in utilising portions only of the individual juxtaposed surfaces for the transference of electric heating current so as to limit the heating effect of said current substantially to said portions and applying pressure so as to unite the parts by a weld of less area than that of the juxtaposed surfaces.

9. A process for uniting two parts together consisting in utilising portions only of the individual juxtaposed surfaces for the transference of an electric current the utilised portions being prepared so as to localise the heating effect of said current and applying pressure to unite the parts by a plurality of isolated electric welds.

10. A process for uniting two parts together consisting in leading an electric current across portions only of the individual juxtaposed surfaces of the parts and applying pressure to said parts so as to integrally unite the individual juxtaposed surfaces together by a plurality of isolated electric welds.

11. A process for uniting two parts together consisting in forming projections on the individual juxtaposed surfaces of said parts leading an electric current across the parts by way of said projections and applying pressure to unite the individual juxtaposed surfaces by a plurality of isolated electric welds.

12. A metal article having component

employment of the inventive faculties.

In view also of the fact that the applicant is enabled to provide a process which has been desired for a long time, viz., to unite turbine blades to their carriers in a manner which is ^{effective} expeditious and inexpensive in practice, shows that the process disclosed by the applicant is of great utility.

In view of the above the applicant maintains that the claims rejected by the Examiner contain patentable subject matter and respectfully solicits a reconsideration of the rejected claims.

✓ Please add the attached claims and attention is called to the
remarks appended hereto.

Respectfully,

S.Z. de Ferranti,

By

Spear, Middleton, Donaldson, & Spear
per Walter Donaldson,

ATTORNEYS.

1274

parts thereof united by a weld of less area than that of the juxtaposed surfaces.

13. Composite metal articles having individual abutting portions united together by a plurality of isolated welds.

14. A metal article having a plurality of current localizing portions formed on one of its surfaces.

The above new claims are submitted to the Examiner's consideration as being patentable over the state of the art disclosed by the results of the Official search. The above claims ^{are} clearly differentiated from the process disclosed in Cowdery's patent of record. In Cowdery's specification, in an article produced in accordance with the directions given therein, the weld between the parts is spread over the whole of the individual abutting portions, the parts A, being the individual portions of the head A which abut against similar parts of the braces B. In this process, therefore, the whole of the opposing surfaces are operative in conducting the heating current and the whole of the abutting portions are available for welding purposes. This means when the cross-section becomes large, that a much greater amount of current is utilized in uniting the parts than is absolutely necessary, as by utilizing the applicant's process if the current is restricted to definite portions of the abutting surfaces then the parts will be united together by a plurality of isolated welds, which for all practical purposes is strong enough to withstand ordinary conditions of working.

1375

In proof of this, the applicant finds that when welding turbine blades to their carrying elements by the method which he has disclosed in this specification the blades may be hammered over at right angles without any signs of the weld giving way. The applicant, therefore, utilizes only a portion of the area which might be utilized for welding, and thus by limiting the amount of cross-sectional area available for the conduction of the current, the heating effect of the same is localized and the amount of current required for the weld reduced to the absolute minimum. This process has not been disclosed in any of the specifications cited by the Examiner, and consequently the applicant respectfully submits that the new claims embody patentable subject matter. The process so far as the applicant knows, is novel. The parts are united together in an exceedingly efficient manner. Further, the amount of current is reduced to the bare minimum requisite for enabling the desired strength of weld to be obtained, and in view of this fact the amount of current used and the expense of each weld is reduced to the absolute minimum.

In view of these advantages the applicant very respectfully requests a reconsideration of the case, and hopes that it will soon pass to an early allowance.

Respectfully,

S.Z.de Ferranti,

By Spear, Middleton, Donaldson & Spear.
per Walter Donaldson.

ATTORNEYS.

276

APPLICATION ROOM
DEC 5 1910
U.S. PATENT OFFICE

To the Commissioner of Patents:

Please enter the appearance of the undersigned in
the accompanying case.

Ellis Spear

F. L. Middleton

Walter Donaldson

James M. Spear

Address only
The Commissioner of Patents,
Washington, D. C.,
and not any official by name.

All communications respecting this
application should give the serial number,
date of filing, title of invention, and
name of the applicant.

HB/BWT

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

WASHINGTON

January 6, 1911.

MAILED

Sebastian Ziani de Ferranti,

C/o Spear, Middleton, Donaldson & Spear,

Washington, D. C.

Please find below a communication from the EXAMINER in charge of ^{your} ~~the~~ application of

206,034, filed May 14, 1904, for Process for Electrically

Welding Turbine Blades to their Carrying Elements.

E. B. Moxham

Commissioner of Patents.

70-301

In response to amendment filed Dec. 5, 1910.

Concerning the argument made by applicant especially the sentence beginning in line 15, page 2, of the above paper, the subject matter of this sentence is shown to be old in Coudery, of record.

Claims 1 to 4 and claim 6 are each rejected in accordance with the Office letter of July 23, 1910.

New claims 8, 9 and 10 are each drawn to a method of electric welding and constitute a shifting of ground. They are therefore required to be canceled under ex parte Selle, 110 O.G. 1728.

Claims 8 and 9 are additionally rejected as incomplete since they omit the step of heating.

Claims 8 to 14 are each rejected on Coudery and also on Moxham, of record.

Claims 12, 13 and 14 are each also rejected on DeFerranti, of record.

Claims 5 and 7 are believed to be allowable.

It is obvious that a clear issue has been raised between applicant and the examiner and the case should be prosecuted to an early final issue.

H.B.

C.A. Nixon,
Examiner, Division 13.

RECEIVED

DEC 19 1911

Division 13, paper No. 29

Room 329.

Sebastian Ziani de Ferranti

Serial No. 208034.

Filed May 14th, 1904.

Process for electrically welding turbine blades to their carrying elements.

Amendment. N

APPLICATION ROOM

DEC 18 1911

U. S. PATENT OFFICE

To the Commissioner of Patents.

Sir,

This amendment is in reply to the Official letter of January 6th, 1911.

With regard to the first paragraph of the Official letter in which the Examiner takes objection to certain parts of the argument filed on the 5th December, 1910, the applicant would point out that the paragraph referred to simply states the problem with which the applicant was confronted. Further, he was pointing out the difference between his process and that described by Eyre of record, and the difference between the applicant's process and that of Eyre is stated to be that in Eyre the problem was for uniting two pieces of the same cross-section, while the applicant had to unite two pieces of greatly differing masses. The Examiner states that this is old as shown in Cowdery's specification; the applicant, however, does not agree that his process is disclosed in Cowdery's specification, and the difference of the masses dealt with by the applicant are very much greater than the difference in the masses dealt with by Cowdery.

Applicant admits that Cowdery states in his specification that the object of the particular method which he employs is for the purpose of forming welds between the heads and the braces, without

heating the entire head. If it is assumed that the difficulties of Cowdery and the applicant are the same, yet it does not necessarily follow that the particular methods in which the difficulty was overcome are identical. Further, if it is assumed that the difficulties encountered in both are identical, then there may also be subject matter in two different solutions for overcoming the same difficulty, so long as the methods of solution are not the same.

The question therefore comes to be whether the process disclosed in Cowdery's application is identical with that which the applicant has disclosed. The applicant must emphatically state that Cowdery's method is essentially different from his.

On a fair construction of Cowdery's specification, no other interpretation can be put upon the document than that the parts to be united are first brought separately to the welding point before pressure is applied, so that in forming a rake according to Cowdery's specification, two distinct operations are necessary, first by means of an electric current to place the ends to be united between clamps, raising each of the parts individually to the welding temperature, and then forcing them together to form the weld. In the applicant's process, however, the method of procedure is entirely changed, and both the operation of heating and forcing together under pressure are performed simultaneously. Further, in the applicant's process, no clamps are necessary and the current being led across the points of contact of the two parts to be united, allows the parts to be forced together whenever they have

softened under the influence of heat to the required extent. It is therefore submitted that this essential difference exists between Cowdery's process and the applicant's viz., that in Cowdery's process the parts to be united are separately raised to the welding temperature before being forced together under pressure, while in the applicant's process the operations of heating and forcing together take place simultaneously. It is thought that this difference is sufficient evidence of the inventive faculties having been exercised, and raises the method of Ferranti apart from commercial considerations whatever, to the dignity of invention.

Brace claims 8 to 14.

Respectfully,

Sebastian Ziani de Ferranti,

By- Spear Middleton Donaldson & Spear

Attys.

December 16, 1911.

HMCB

Address only
"The Commissioner of Patents,
Washington, D. C."

Paper No. 30
All communications respecting this
application should give the serial number,
date of filing, and title of invention.

WLR/RAJ

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

WASHINGTON

Jan. 20, 1912.

MAILED.

S. Z. de Ferranti,

Care Spear, Middleton, Donaldson and Spear,
City.

Please find below a communication from the EXAMINER in charge of ^{your} ~~the~~ application ~~X~~

208, 034, filed May 14, 1904----

Process for Electrically Welding etc.

E. B. Moore.

Commissioner of Patents.

Replying to amendment filed Dec. 18, 1912.

This case has been transferred to Division 3 and
a farther search has disclosed the patent to Thomson,
487, 302, Dec. 6, 1892, 219 - 10, Fig. 4 of which is considered
to anticipate claims 1 and 2.

Claims 3 and 4 are considered allowable.

Claims 5 and 7 are for an article independent of the
process of manufacture and of a recognized different art.
Division is therefore required between claims 5 and 7 and the
remaining claims. It is not clear, however, why these claims
are not barred to applicant in this application on account
of his patent # 874, 398, Dec. 24, 1907, Steam Engines, Rotary.
There seems to be no line of division between the claims in that
case and claims 5 and 7.

Claims 6, as stated in the last Office letter is
still considered to be merely an aggregation of independent
steps since the details of broadly forming a balanced body
or carrier has no relation to the specific welding steps.
This claim is rejected upon the ground of being an aggregation
of independent steps. The steps of balancing the body and
symmetrically arranging the welding points is considered to be

merely mechanical skill.

It is noted that the amendment to page 3 (Apl. 30, 1909) is not inserted at the right place. "and" should have been inserted at the end of line 9 and the description of Fig. 12 and 13 should stand between line 9 and 10. Applicant's attention is also called to the fact that no figures 12 and 13 agreeing with the description at this place and that inserted on page 5, ~~ix~~ between lines 17 and 18 have ever been inserted in the drawings. This is considered necessary in order to support the limitations to claims 1 and 2 and the statement inserted at the end of the specification by amendment of Apl. 19, 1907,

The objection as to the drawings being photolithographs, still applies.

Wm J Rich,
Examiner, Div. 3.

W. R.

APPLICATION ROOM
DEC 30 1912
U. S. PATENT OFFICE

Serial No 208034

Paper No. 31

U. S. PATENT OFFICE,
DEC 31 1912
DIV. 3.

Amendment U

Room 1⁵⁵.
S. Z. de Ferranti.
Serial No. 208034.
Filed May 14th, 1904.
"PROCESS FOR ELECTRICALLY WELDING &c."

To the Commissioner of Patents.

Sir,

This amendment is in reply to the Official letter of January 20th, 1912.

With reference to the U. S. Patent to Thomson, No. 487302, which the Examiner considers anticipates claims 1 and 2, the applicant, after careful consideration of the specification and drawings of the above patent, cannot agree with this view of the Examiner.

In Thomson's specification a method of electric welding is described and illustrated by means of drawings and the whole of the description and the drawings relate to a process of attaching parts of different mass together by electric welding. On page 1, line 45, the following statement occurs: "The present invention consists in uniting pieces in such a manner that a greater current passes through one piece than through another or others concerned in the operation, whereby if the one piece be larger than the other it may reach the welding temperature at the same time as the others."

In the whole of the methods illustrated, Thomson effects the welding together of two pieces of different mass, by passing a greater current through the part of larger mass than that which passes through the smaller mass.

In Figure 4 to which the Examiner especially draws the applicant's attention, a larger mass, B, is shown

1234

which is provided with two small projections, *I* and *I'*, to which the small pieces, *a* and *b*, are welded respectively. In this method it is stated on Page 2, line 103, that the arrangement for the supply of the current to the pieces between the clamps, are to be made on the same principles as set forth in connection with Figures 1 and 2, the object being to traverse the larger piece by a larger amount of current than the smaller piece, whereby the heating operation in each goes on proportionately.

In the only example which Thomson shows of uniting a larger mass to a single smaller mass, he effects this as described with reference to Page 2, at lines 30-39, by utilizing a third piece for the purpose of increasing the current passing through the larger piece, so as to raise the piece to be welded to the desired temperature, and it is evident that as this principle is also to be applied when welding, in Figure 4 for example, the part, *a* to the part *n*, it would be necessary to apply a current through the part, *b*, and temporarily initially for the purpose of raising the parts, *n* and *a*, to the desired welding temperature. Also in claim 1, he has stated as the subject matter of his invention, the herein described improvement in welding metals electrically consisting in making contact with both the pieces to be united and passing a current of greater strength through one piece than the other.

Taking Thomson's specification as a whole, it is evident that the only method which he has disclosed of welding parts of different mass together, is to pass a greater current through the larger mass than through the smaller one. In no case has he disclosed a method like the applicant's, in which the same current passes through

both masses being welded.

In all cases where Thomson desires to weld two parts together, of different mass, he applies current through a third part to the larger mass in the initial stages of the operation, in order to heat the parts proportionately. In no case is there the slightest suggestion in Thomson's process of welding two parts of different mass together, without the aid of a supplementary piece to pass a greater current through the larger piece than the smaller piece.

In order to clearly differentiate the applicant's claim from Thomson of record, the applicant makes the following amendments to claims 1 and 2:

Claim 1, line 9, before "electric" insert "and uniform"

Claim 2, line 8, before "electric" insert "uniform"

It is submitted that these amendments clearly differentiate the applicant's process from that described in Thomson's specification.

✓ Cancel claims 5 and 7, and re-number claim 6 as claim 5.

The applicant cannot agree with reference to claim 6, that this claim is merely an aggregation of independent steps. In the construction of rotors, it is wellknown, that one of the most important parts is the balancing of the rotor, as if the centre of mass does not coincide with the centre of rotation, then vibrations of greater magnitude will be set up owing to the speed at which the rotor revolves.

In the present construction of rotors, after all the blades have been attached, it is necessary to balance the rotor by drilling holes in the required positions, so as to remove excess of metal at these parts, so that according to the ordinary construction, the

procedure is to form the rotor first and thereafter to make its mass symmetrical by removing metal at the necessary positions. This method of balancing is at best only approximate, while it also requires the exercise of much skill and ingenuity to determine the precise spot from which the metal ought to be removed to give the best results. According to the applicant's process, however, the rotor is formed symmetrical at the commencement, and as the blades are all equal to one another, and symmetrically disposed with regard to the axis of ~~the casting~~^{rotation}, it will be evident that ~~the~~ a considerable expenditure of skill and time is prevented by the applicant's invention.

The applicant considers that the welding of blades on to the body has a certain relationship with the balancing the same, in view of the fact to which the rotor is applied, as the removal of the metal for the purpose of welding is effected in such a manner as to leave the rotor absolutely symmetrical, after the parts have been removed by the welding operation.

In view of the above, a reconsideration of this claim is respectfully requested.

✓ With regard to the amendment of April 30th, 1909, page 3, insert "and" at the end of line 9, and the description of Figures 12 and 13 between lines 9 and 10. A drawing containing new Figures 12 and 13 is filed herewith.

The objections to the drawings are being complied with, but it is respectfully requested that those at present on file be allowed for examination purposes.

A new set of hand-made drawings will be filed before issue of the case.

An early allowance on the case is respectfully
requested.

Respectfully,

S. Z. de Ferranti.

by

Spear Middleton, Donaldson & Spear
ATTORNEYS.

1288

Div. 3 ROOM 175

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The Commissioner of Patents,
Washington, D. C.

U. 260

Paper No. 32

All communications respecting this
application should give the serial number,
date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR

WLR/RAJ

UNITED STATES PATENT OFFICE

WASHINGTON

Jan. 18, 1913

MAILED.

S. Z. de Peranti,

C/o Spear, Middleton, Donaldson and Spear,

City.

Please find below a communication from the EXAMINER in charge of ^{your} application.

308, 034, filed May 14, 1914,

Process for Electrically Welding etc.

E. B. Moore

Commissioner of Patents.

Replying to amendment filed Dec. 30, 1912.

The amendments to claim 1 and 2 do not apply, the term "electric" not being found in lines 9 and 8, respectively, these claims.

Since claims 5 and 7, for the article, have been canceled the title in the preamble should be amended.

Applicant's remarks fail to point out any alleged relationship between the steps of balancing the rotor and welding blades thereto. It seems to be obvious that the rotor can be balanced, either before or after attaching the blades. Claim 5 is again rejected for this reason.

Applicant states that substitute drawings will be filed but the Office practice has been changed so that it is desirable to correct the present drawings rather than to file new ones. No action can be made upon claims 2 and 3 in view of the fact that the amendments do not apply.

Wm J Rich

Examiner. Div. 2.

W. R.

APPLICATION ROOM

DEC 29 1913

U. S. PATENT OFFICE

APPLICATION ROOM

DEC 27 1913

U. S. PATENT OFFICE

Serial No 208034

Paper No. 33

Amendment P

8978

Room 329.

S. Z. de Ferranti.

Process and Apparatus for Electrically

Welding Turbine Blades Etc.

Filed May 14, 1904.

#208, 034.

U. S. PATENT OFFICE

DEC 31 1913

DIV. 3

To the Commissioner of Patents:-

Responsive to office action of January 18, 1913 in this case, please amend as follows:-

✓ In amendments to claims 1 and 2, the line should have been 7 instead of 9 and 8 respectively. In order to avoid confusion the claims 1 and 2 are herein given as it is desired they should now read.

1. The method of attaching turbine blades to their carrier of relatively great mass which consists in adjusting the heat capacity of the localized area of the carrier at the point of attachment by partially isolating these areas from the remainder of the carrier so that a welding temperature may be reached notwithstanding the cooling effect of the mass of the carrier, and passing a uniform electric heating current directly through the carrier and by way of the clamps through the blades to weld the blades in succession to the carrier, substantially as described.

2. The method of attaching turbine blades to their rotor carrying elements one by one, consisting in equalizing the heat capacity of the welding parts by limiting the conducting areas of the carrier at the points of blade attachment symmetrically in relation to the axis of rotation of the motor, and enclosing the blades between clamps so that on heating locally by a uniform electric current, the blades

and carrier rise to approximately the same temperature on welding the blades to the carrier so prepared, substantially as described.

Change the title to --Process for Electrically Welding Turbine Blades--.

The Office will be asked to correct the drawings.

Applicant trusts that after this amendment has been made claims 1 and 2 in view of the argument last filed will be found to be acceptable and will be allowed.

With regard to the remark by the Examiner that no relationship exists between the step of balancing the rotor and welding the blades thereto, it is submitted that it appears to us that such a relationship exists, as by the method which the applicant discloses of attaching the turbine blades to their carrying elements, the symmetry of the rotor is preserved.

It is quite true, as the Examiner remarks, that the rotor may be balanced either before or after attaching the blades, but in the present case both these operations are dispensed with, as owing to the fact of the blades being spaced symmetrically round the circumference of the rotor, the symmetrical disposition of the masses is preserved, and the balancing operation previously required in the manufacture of rotors, dispensed with.

Respectfully,

S. L. de Ferranti,

Sy-Spear Middleton Donaldson & Spear

Attys.

Dec. 24, 1913.

AM/HGA.

1291
No. 3 175

Assistant
The Commissioner of Patents,
Washington, D. C.,
and not any official by name.

2-280

Paper No. 34

All communications respecting this
application should give the serial number,
date of filing, title of invention, and
name of the applicant.

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

SLR/RAJ

WASHINGTON

Jan 10, 1914.

MAILED.

Spear, Middleton, Donaldson and Spear,

Washington, D. C.

Please find below a communication from the EXAMINER in charge of the application of

S. de Ferranti, Process for Electrically Welding etc

208, 034, filed May 14, 1904.

Thomas Ewing
Commissioner of Patents.

Replying to amendment filed Dec. 29, 1913.

Claim 5 will be allowed over the references formerly
cited and the case now awaits the required corrections of the draw-
ing.

Wm J Rich

Examiner. Div. 3.

W. R.

12932

Serial No. 208034

Paper No. 35 Letter

PRINTED LETTER HEAD OMITTED.

MAIL ROOM
DEC 5 1914
U. S. PATENT OFFICE

Washington, D. C. December 4, 1914.

U. S. PATENT OFFICE.
DEC 19 1914
DIV. 3

ACCOUNT

To the Commissioner of Patents,
Washington, D. C.

Sir:

Please correct the drawings in the case
of Sebastian Z. de Ferranti, Filed May 14, 1904,
Serial No. 208, 034, for improvement in Process and
Apparatus for Electrically Welding Turbine Blades
to their Carrying Element, as per requirements of the
Examiner in the last Office letter, charging the cost
of the same to our account. Please advise us as soon
as the drawings have been corrected and the cost there-
of.

Very respectfully,
Spear Middleton Donaldson & Spear

HMB

Spear, Middleton. et al C

1223

U. S. PATENT OFFICE

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DEC 5 1914
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BOOK 124 PAGE 33 DIV. E

PRINTED FOR FILE DEC 12 1914 Pi

CORRECTION ORDERED

DEC 12 1914

CORRECTED DEC 18 1914

ACCOUNT \$ 6.00

BOOK 257 PAGE 122 DIV C

FOR DIV. 3

W

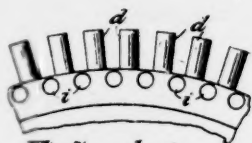


Fig. 7.

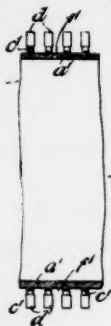


Fig. 4.

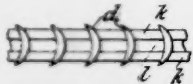


Fig. 8a

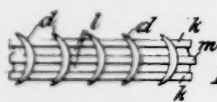


Fig. 9a



Fig. 10a.

ATTEST:
Edmund S. Landon

INVENTOR
SEBASTIAN Z. DE FERRANTI
BY [Signature] ATTORNEY

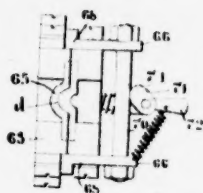


Fig. 12.

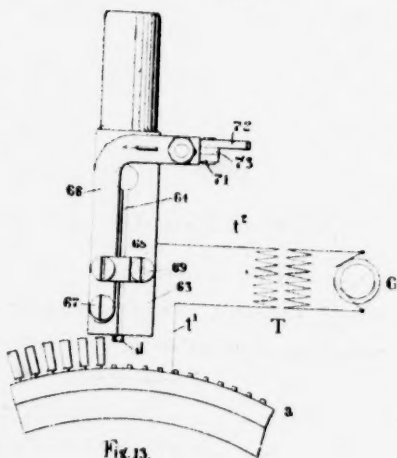


Fig. 13.

WITNESSES

[Faint, illegible text]

Schubert J. de Ferranti INVENTOR
BY *[Signature]*
Spec. Maschinen, & Eisenwaren, Spec. ATTORNEY

Serial No. 208034

Paper No. 36 Letter

APPLICATION ROOM
DEC 24 1914
U. S. PATENT OFFICE

U. S. PATENT OFFICE
DEC 26 1914
DIV. 3

Room 329.

Sebastian Z. de Ferranti.
Process and Apparatus for
Electrically Welding Turbine
Blades to their Carrying
Element.

Filed May 14, 1904.

#208, 034.

To the Commissioner of Patents:

We are informed by the Office that the drawings in the
above case have been corrected, and as this places the case
in condition for allowance early issue will be appreciated.

Respectfully,

Sebastian Z. de Ferranti,

By- Spear Middleton Donaldson & Spear

Attys.

December 23, 1914.

DEC

1297

Serial No. 208034

Paper No. 37 Letter.

APPLICATION ROOM
DEC 29 1914
U. S. PATENT OFFICE

U. S. PATENT OFFICE
DEC 29 1914
DIV. 3

Room 329.

S. Z. de Ferranti.

Process and Apparatus for Electrically
Welding Turbine Blades to their Carry-
ing Element.

Filed May 14, 1904.

Serial Number 208, 034.

Hon. Commissioner of Patents:

✓ Please cancel sheet 2 of the drawings as
a a a
Figures 4, 7, 8, 9, and 10 contained on this sheet
have been transferred to sheet 4.

Respectfully,

S. Z. de Ferranti.

By- Spear Middleton Donaldson & Spear

Attys.

December 28, 1914.

JMS/BIB.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

WASHINGTON Dec. 31, 1914.

Sebastian Ziani de Ferianti,

Sir: Your APPLICATION for a patent for an IMPROVEMENT in
Process for Electrically Welding Turbine Blades,

filed May 14, 1904, has been examined and ALLOWED.

The final fee, TWENTY DOLLARS, must be paid not later than SIX MONTHS from the date of this present notice of allowance. If the final fee be not paid within that period, the patent on this application will be withheld, unless renewed with an additional fee of \$15, under the provisions of Section 4897, Revised Statutes.

The office delivers patents upon the day of their date, and on which their term begins to run. The printing, photolithographing, and engrossing of the several patent parts, preparatory to final signing and sealing, will require about four weeks, and such work will not be undertaken until after payment of the necessary fee.

When you send the final fee you will also send, DISTINCTLY AND PLAINLY WRITTEN, the name of the INVENTOR, TITLE OF INVENTION, AND SERIAL NUMBER AS ABOVE GIVEN, DATE OF ALLOWANCE (which is the date of this circular), DATE OF FILING, and, if assigned, the NAMES OF THE ASSIGNEES.

If you desire to have the patent issue to ASSIGNEES, an assignment containing a REQUEST to that effect, together with the FEE for recording the same, must be filed in this office on or before the date of payment of final fee.

After issue of the patent uncertified copies of the drawings and specifications may be purchased at the price of FIVE CENTS EACH. The money should accompany the order. Postage stamps will not be received.

Final fees will NOT be received from other than the applicant, his assignee or attorney, or a party in interest as shown by the records of the Patent Office.

Respectfully,

Thomas Ewing
Commissioner of Patents.

Spear, Middleton, Donaldson & Spear,

Washington, D. C.

IN REMITTING THE FINAL FEE GIVE THE SERIAL NUMBER AT THE HEAD OF THIS NOTICE.

UNCERTIFIED CHECKS WILL NOT BE ACCEPTED.

1399

MEMORANDUM

OF

FEE PAID AT UNITED STATES PATENT OFFICE.

\$20 REC'D

D JUN 30 1915

C.C. U.S. PAT. OFFICE (Be careful to give correct Serial No.)

Serial No. 208034

INVENTOR: Sebastian Z. deFerranti, 1915

PATENT TO BE ISSUED TO Sebastian Z. deFerranti

NAME OF INVENTION, AS ALLOWED:

Process and apparatus for electrically welding

turbine blades to their carrying element

DATE OF PAYMENT:

June 30/15

FEE:

\$ 20

DATE OF FILING:

May 14/04

DATE OF CIRCULAR OF ALLOWANCE:

Dec 31/1914

The Commissioner of Patents will please apply the accompanying fee as indicated above.

Spear, Middleton Donaldson & Spear

Attorney.

SEND PATENT TO

Attys

S. Z. DE FERRANTI.

PROCESS FOR ELECTRICALLY WELDING TURBINE BLADES.

APPLICATION FILED MAY 14, 1904.

1,148,221.

Patented July 27, 1915.

3 SHEETS—SHEET 1.



Fig. 2.

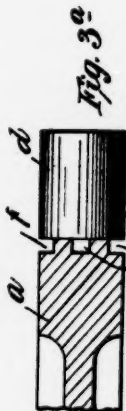


Fig. 3a.



Fig. 6.



Fig. 1.



Fig. 1a.



Fig. 3.



Fig. 5.

ATTEST
*Edmund
 Edward Barton*

INVENTOR
 SEBASTIAN Z. DE FERRANTI

By *Heer, Middleton, and Heer* ATTORNEYS

S. Z. DE FERRANTI.
 PROCESS FOR ELECTRICALLY WELDING TURBINE BLADES.
 APPLICATION FILED MAY 14, 1904.

1,148,221.

Patented July 27, 1915.
 3 SHEETS—SHEET 2.

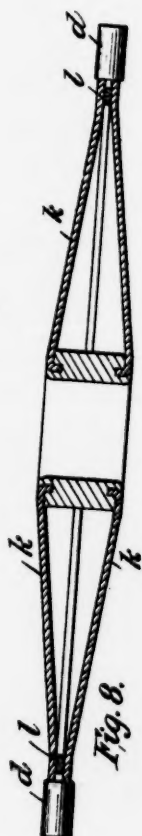


Fig. 8.

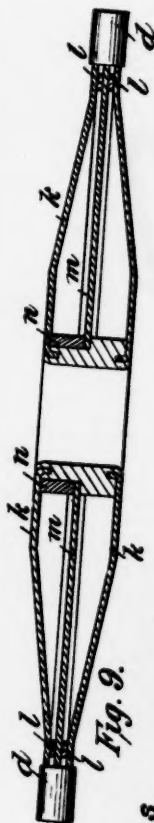


Fig. 9.



Fig. 10.



Fig. 11.

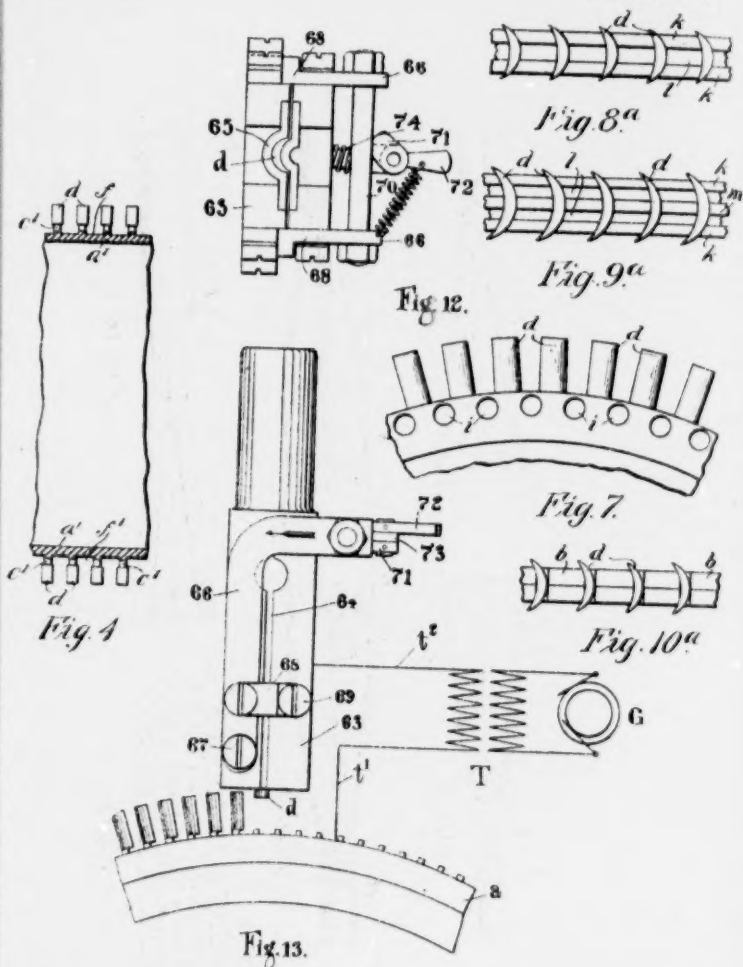
ATTEST:
 C. Middleton
 Edward Barton

INVENTOR
 SEBASTIAN Z. DE FERRANTI
 BY Spear, Middleton, Sonlson & Spear
 ATTYS

1,148,221.

Patented July 27, 1915.

3 SHEETS—SHEET 3.



WITNESSES

H. M. Barrett
 H. L. Aiden

Sebastian J. de Ferranti INVENTOR
 BY Speer, Muddala, Donatelli & Speer ATTORNEYS

UNITED STATES PATENT OFFICE.

SEBASTIAN ZIANI *de* FERRANTI, OF HAMPSTEAD, LONDON, ENGLAND.

PROCESS FOR ELECTRICALLY WELDING TURBINE-BLADES.

1,148,221.

Specification of Letters Patent.

Patented July 27, 1915.

Application filed May 14, 1904. Serial No. 208,034.

To all whom it may concern:

Be it known that I, SEBASTIAN ZIANI DE FERRANTI, a subject of the King of Great Britain and Ireland, and residing at 31 Lyndhurst road, Hampstead, London, N. W., England, have invented a certain new and useful Process for Electrically Welding Turbine-Blades, of which the following is a specification.

The invention relates to the electrical welding of turbine blades on to the wheels, rings or drums carrying them and has for its object to overcome the difficulties which have been experienced in electrically welding together two such parts differing considerably as regards their power of rising to the required welding temperature when heated at the point of junction, so that blade carrying elements with welded blades may be reliably produced in an inexpensive manner.

The main difficulty arises through the blades and their carriers differing as regards their power of conducting heat away from the welding point.

In the welding of a turbine blade to the carrier to which it is to be secured, it is found that the comparatively large volume of metal forming the carrier, rapidly conducts heat away from the welding point thus preventing the temperature of the carrier rising to the required extent and causing an unsatisfactory weld.

The invention, therefore, consists broadly in adjusting the volume of the blade carrying element in the neighborhood of the welding point so that approximately equal heating occurs in both faces to be welded.

Referring to the accompanying drawings which, with the exception of Figure 4, show the invention applied, by way of example, to a type of parallel flow turbine in which the blades are mounted on the edge of a wheel like body, Fig. 1 is a part side elevation of such a wheel having cross grooves, Fig. 1^a being an edge view; Fig. 2 shows a similar edge view of a modification in which sets of intersecting grooves are adopted; Fig. 3 shows an edge view of a form having circumferential grooves, Fig. 3^a being a section on the line A A of Fig. 3; Fig. 4 shows, in longitudinal sectional elevation, part of a drum carrier to which the blades are welded in accordance with one form of the invention; Figs. 5 and 6 show edge views of modifications in which holes are bored radi-

ally into the edge of the disk, while Fig. 7 is a part side elevation in which holes are bored through from face to face of the disk; Fig. 8 shows a sectional plan of a form of wheel built up of two dished disks, held apart at their circumferential portions by distance pieces, Fig. 8^a being a partial edge view to a larger scale; Fig. 9 is a similar sectional plan of a modified form of wheel built up of three disks, while Fig. 9^a is a corresponding partial edge view also to a larger scale; Fig. 10 shows a part sectional elevation of a wheel built up of two comparatively thick disks having notched edges, Fig. 10^a being a partial edge view, while Fig. 11 shows an edge view of a form of wheel built up of a series of "stepped" laminae and Figs. 12 and 13 show a form of clamp and a diagram of the electrical connections.

(It will be seen that all the edge views in the preceding figures are shown as developments for clearness of drawing and not as true projections.)

The same reference symbols are, when possible, used in the accompanying drawings to denote similar parts.

In carrying out the invention according to the form shown in Figs. 1 and 1^a, the turbine wheel or disk is shown at *a*, cross grooves, *b*, being cut in its circumferential edge so as to leave projecting portions of metal, *c*, to which the turbine blades, *d*, are welded. The same object is attained by cutting two intersecting sets of grooves, *e*, in the edge of the disk, as is shown in Fig. 2 or by cutting circumferential grooves, such as *f*, completely around the edge (see Figs. 3 and 3^a).

Fig. 4 shows the invention according to one form applied to the case of a drum blade carrier, *a'*; the drum is grooved circumferentially with grooves, *b'*, the intervening collars of metal being then cross-cut to form projecting teeth, *c'*, on which the blades are welded.

According to a modified form, radial holes, *h*, may be bored a short distance into the edge of the disk, these holes being either arranged in patterns so as to leave intervening projections of untouched metal to which the blades may be welded as shown in Fig. 5, or arranged without particular reference to the position of the blades, (see Fig. 6).

In Fig. 7, a method is shown of removing

metal in the neighborhood of the welding point by boring holes, *i*, through (or partly through) from face to face of the disk at a radius slightly less than that of its outside edge. The object to be kept in mind in this as in other modifications, is to remove sufficient metal to enable the temperature to rise to the welding point as explained above, while at the same time leaving sufficient areas untouched to insure the mechanical strength in the welded joint.

Referring now to Figs. 8 and 8*, a form of wheel is shown somewhat diagrammatically which is built up of two dished disks, *k*, of comparatively thin metal, held apart by their circumferential portions by one or more distance pieces such as *l*, disposed at a radius somewhat less than the maximum radius of the disks, the blades, *d*, being welded in position on their outside edges.

Figs. 9 and 9* show a type of wheel generally similar to that last described but having an intermediate plane disk, *m*, in addition to the two dished disks, *k*; a portion, *n*, of the hub, *o*, is in this case made detachable so as to allow the different parts of the wheel to be assembled. Distance pieces, *l*, are indicated as before but any other convenient method of holding the disks in their correct relative position may be adopted.

In every case it will be seen that those portions of the carrier to which the blades are to be welded are partially isolated from the body of the carrier by slots, holes and so forth so as to limit the cross-sectional area available for the conduction of heat, and so compel the carrier to rise to the welding temperature. On the other hand to prevent the blades being burnt away, their mass is artificially increased by holding them between clamps or jaws of high heat conductive material such as copper. Thus referring to Figs. 12 and 13, the jaw holder 63, is separated into two branches by means of the slot, 64, each branch carrying a copper jaw, 65, shaped so as to clear adjacent blades. Between the jaws, 65, the blade to be welded is clamped, so as to leave the tip only exposed as seen in Fig. 13, and in order to insure a good contact and rigid holding of the blade in the jaws, a clamping device is preferably arranged in addition to that provided by the spring of the two branches of the jaw holder.

According to the form shown links, 66, are pivoted at 67, to one branch of the jaw holder, while short cross links, 68, connect the links, 66, to the other branch to which they are pivoted at 69. The long links, 66, are curved as shown, and are connected at their non-pivoted ends by the cross-piece, 70, to which pressure to clamp the blade is applied in the direction of the arrow (see Fig. 13) by means of the cam, 71, and the hand lever, 72, both of which are secured

to a common axle rotatably mounted on any convenient support, 73. A spring such as 74, serves to return the links when the blade is released.

The necessary electrical connections to affect the welding are shown diagrammatically in Fig. 13, in which G represents an appropriate source of alternating current, and T, a transformer. It will be seen that while the lead, *e'*, may be connected directly to the carrier *a*, as in the example shown, it is necessary on the other hand that current to the blade, *d*, should be conveyed indirectly by way of the jaw holder, 63, and lead, *e''*.

In Figs. 8 and 9, the dished disks, *k*, are indicated as secured to the hubs, *o*, by pressing the inner edges of these disks into grooves and subsequently burring over the hubs to hold the disks in place.

In the modification shown in Figs. 10 and 10*, two dished disks, *k*, are again employed but of thicker metal, their circumferential portions being brought into contact and cross grooves, *b*, being cut in their edges in accordance with the method described above with reference to Figs. 1 and 1*. Again, that portion of the disk carrying the blades may be built up of a set of thin laminae, *r* (see Fig. 11) the edges of which are notched as at *s*, the laminae being assembled in such a way that the notches, *s*, are "stepped" with regard to each other, so that the intervening projections of metal may follow the shape of the turbine blades to be welded to them.

Instead of notching the laminae, they may be prepared in accordance with other of the methods pointed out above, before being assembled in the manner indicated.

In an invention such as the present, it is not practicable to describe every method of carrying its broad underlying principle into effect, but the scope is sufficiently indicated by the many examples given above and moreover it will be evident without further description, how the invention may be applied to the welding together of turbine blades and carriers of other forms than those described above by way of example.

The electric heating current is passed directly through the carrier and by way of clamps through the blades.

By means of my invention it will be seen that the blades are attached to their carrying elements in an expeditious and efficient manner while in the case of rotors a still further advantage is obtained over the methods of blading commonly employed inasmuch as if properly carried out the attachment of the blades by electric welding introduces no change of symmetry with respect to the axis of rotation and consequently dispenses with the tedious operation of balancing otherwise rendered necessary.

Having now described my invention what I claim as new and desire to secure by Letters Patent is:—

1. The method of attaching turbine blades to their carrier of relatively great mass which consists in adjusting the heat capacity of the localized area of the carrier at the point of attachment by partially isolating these areas from the remainder of the carrier so that a welding temperature may be reached notwithstanding the cooling effect of the mass of the carrier, and passing a uniform electric heating current directly through the carrier and by way of the clamps through the blades to weld the blades in succession to the carrier, substantially as described.

2. The method of attaching turbine blades to their rotor carrying elements one by one, consisting in equalizing the heat capacity of the welding parts by limiting the conducting areas of the carrier at the points of blade attachment symmetrically in relation to the axis of rotation of the rotor, and inclosing the blades between clamps so that on heating locally by a uniform electric current, the blades and carrier rise to approximately the same temperature on welding the blades to the carrier so prepared, substantially as described.

3. Process for the attachment of turbine blades to their carriers consisting in partially isolating those portions of the carrier in the neighborhood of the points of attachment

of the blades, to limit the cross-sectional area available for the conduction of heat therefrom; artificially increasing the volume of the blades by contacting them with metal masses of high heat conductive capacity and finally welding together the carriers and blades so prepared.

4. Process for the attachment of turbine blades to their carriers, consisting in forming circumferential grooves with intervening rings of metal around the carrier thereby limiting the cross sectional area available for the conduction of heat from the point of attachment so that on heating locally, said blade and said carrier rise to approximately the same temperature and welding each blade to a plurality of said rings, as set forth.

5. The method herein described of constructing a turbine wheel, ring or drum, the same consisting first in forming said wheel symmetrically in relation to its center of rotation with the parts next to the welding points reduced to properly conform to the volume of the blades and electrically welding said blades at the said points whereby the symmetry of the wheel is maintained.

In witness whereof I have hereunto set my hand in presence of two witnesses.

SEBASTIAN ZIANI DE FERRANTI.

Witnesses:

FRANCIS JAMES BIGNELL,
WALTER J. SKERTEN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

1904

CONTENTS:

Print (sheets 2 & 4) Dec 12/14

Application	paper#.
1. Rejection	June 22, 1904.
2. Amdt A-	Sept 27, 1904.
3. Rej	Jan 19, 1905.
4. Argmt and Amdt. B	May 23, 1905
5. Rejection.	Aug. 5- 1905
6. Amendment C.	Oct. 10, 1905
7. Rejection	Dec. 16, 1905.
8. Amendment	April 9, 1906.
9. Rejection.	May 1- 1906
10. Argument and Amendment D	Oct. 18-1906
11. Rejection	Dec. 10-1906
12. Amendment E & Argument	Feb. 16 1907.
13. Rejection	Mar. 11-1907
14. Amendment F & Argument	Apr. 19, 1907.
15. Rejection	JUN 4 1907
16. Amendment G	May 9-1908
17. Rejection.	JUN 5 1908
18. Amendment H	Apr. 30, 1908
19. Rejection	MAY 24 1908
20. Amendment I and Sketch.	Dec. 8, 1908.
21. Rejection.	JAN 14 1910
22. Amendment J & Oath.	Mar. 14-1910
23. Amendment K	Apr. 14-1910
24. Rejection.	APR 26 1910
25. Amendment L	June 25-1910
26. Rejection.	JUL 23 1910
27. Amendment M & Appearance	Dec. 5-1910

28. Rejection.		JAN 6 1911
29. Amenament	N	Dec.18-1911
30. Letter.		Jan 20, 1912
31. Amendment	C-	Dec.30, 1912
32. Letter		Jan 18, 1913
33. Amendment.	P-	Dec.29- 1913
34. Letter.		Jan 10, 1914
35. Letter.		Dec. 5, 1914
36. Letter		Dec 24, 1914
37. Letter.		Dec.29, 1914

U.S.PATENT OFFICE
JAN 9 1905
DIVISION No. 13

TITLE:

Improvement in Process for Electrically Welding Turbine Blades

5 claims

(Cl 219 - 10.)

1898

Electric Welding Process

(18)

Serial No. 208,034
343 Sheets Sh

S. Z. DE FERRANTI.
PROCESS FOR ELECTRICALLY WELDING TURBINE BLADES.

1,148,221.

Patented July 27, 1915.

3 SHEETS SHEET 1.

10/12/15



Fig. 2.



Fig. 3.



Fig. 6.

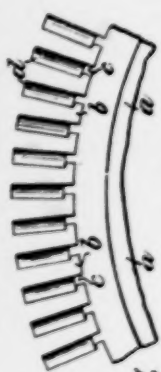


Fig. 1.



Fig. 1a.



Fig. 3.



Fig. 5.

ATTEST
Edward Weston

INVENTOR
SEBASTIAN Z. DE FERRANTI.

By Year, Middleto, Braden & Year ATTYS

Examined Dec 29, 1914.

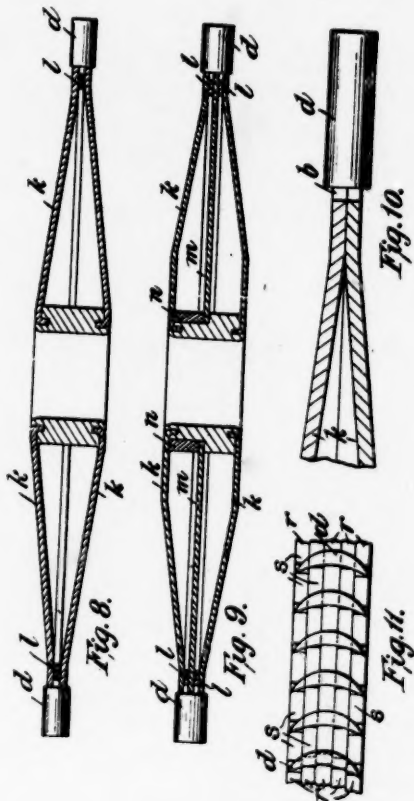
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419 ELECTRICITY RESTATES
as of 1904
Walling, Boston

No. 208,034
3 Sheets Sheet

S. Z. DE FERRANTI.
PROCESS FOR ELECTRICALLY WELDING TURBINE BLADES.
APPLICATION FILED MAY 14, 1904.
Patented July 27, 1915.
3 SHEETS—SHEET 2.

1,148,221.



ATTEST:
Corradellon
Edward Sartin

INVENTOR
SEBASTIAN Z. DE FERRANTI
BY Spear, Middleton, Condon & Spear
ATTY'S

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Filed Dec 10 1914

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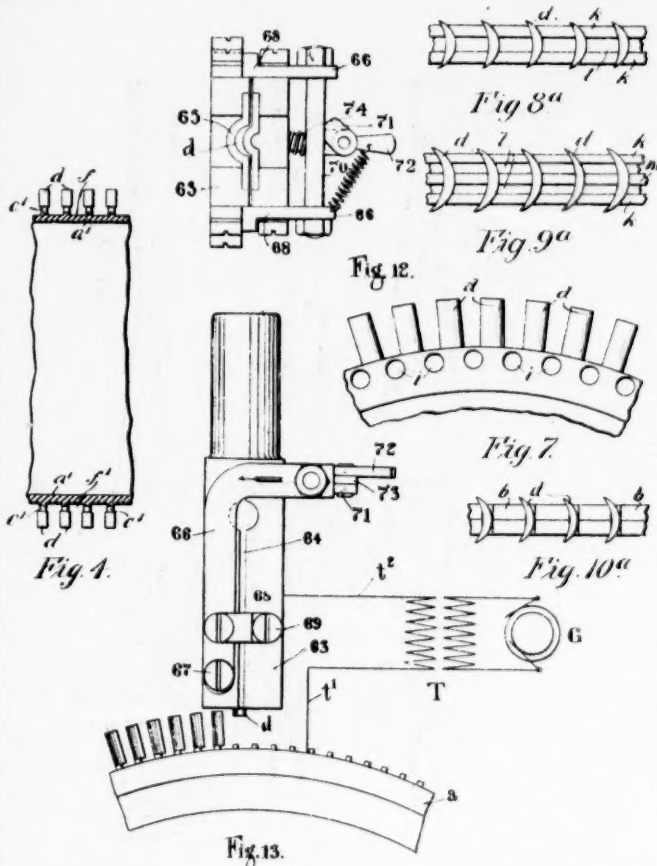
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S. Z. DE FERRANTI.
PROCESS FOR ELECTRICALLY WELDING TURBINE BLADES.
APPLICATION FILED MAY 14, 1914.

1,148,221.

Patented July 27, 1915.

3 SHEETS SHEET 3.



WITNESSES

H. M. Barrett
A. L. Alden

Sebastian J. de Ferranti
BY
Spears, Middleton, Donovan & Spears
ATTORNEYS

Conceded
 Dec 27, 1914

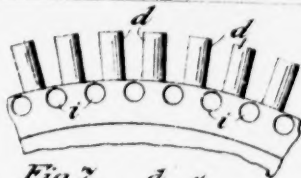


Fig. 7.



Fig. 7.



Fig. 8a



Fig. 9a



Fig. 10a

ATTEST:
 Ed. M. S. L. O. R.
 Edward L. O. R.

INVENTOR
 SEBASTIAN Z. DE FERRANTI

BY Special Master in Charge
 11115

Cancel of Sept 27, 1904

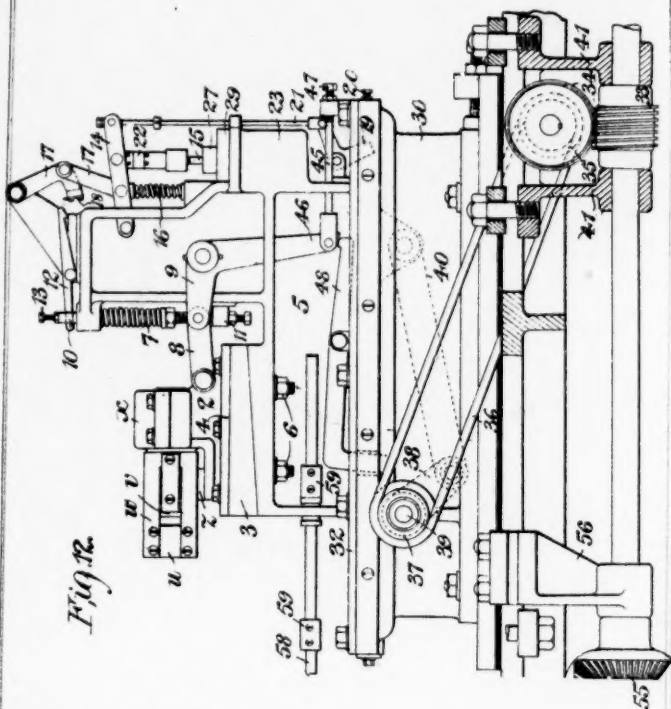


Fig. 12.

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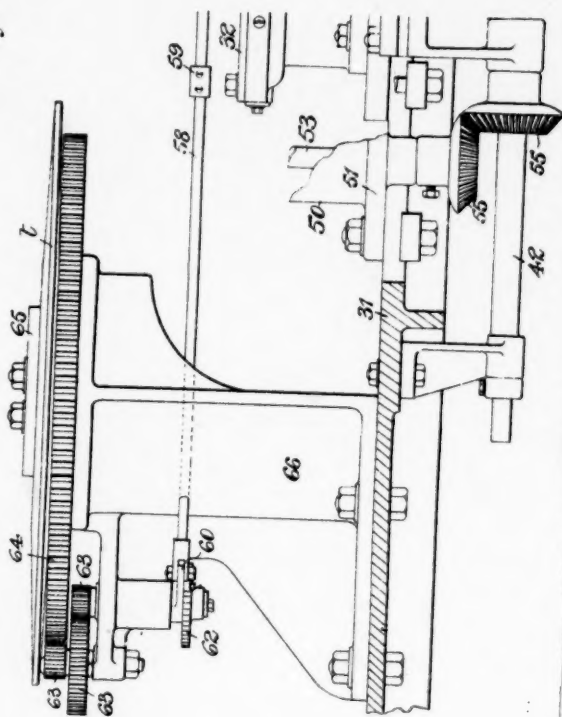
Commissioner
Edward Sarton

INVENTOR
SEBASTIAN Z. DE FERRANTI

By *Wm. M. Sullivan* Attorney
ATTY

Cancel Sept 27-1904

Fig. 12.



ATTEST:

Edward Barton
Edward Barton

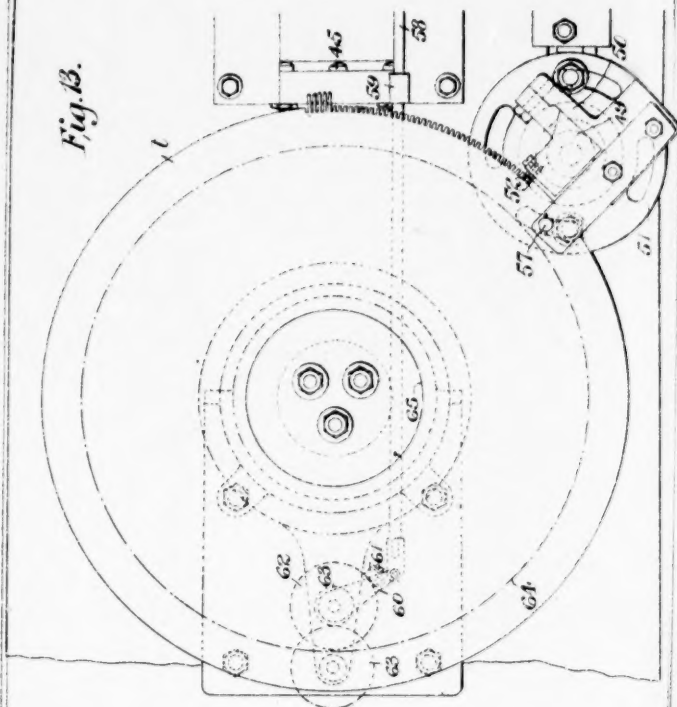
INVENTOR
SEBASTIAN L. DE FERRANTI

By *John Middleton* *London* *attorney*

ATTYS

Conc'd Sept 27, 1904

Fig. B.



ATTEST
Commissioner
Edward Lister

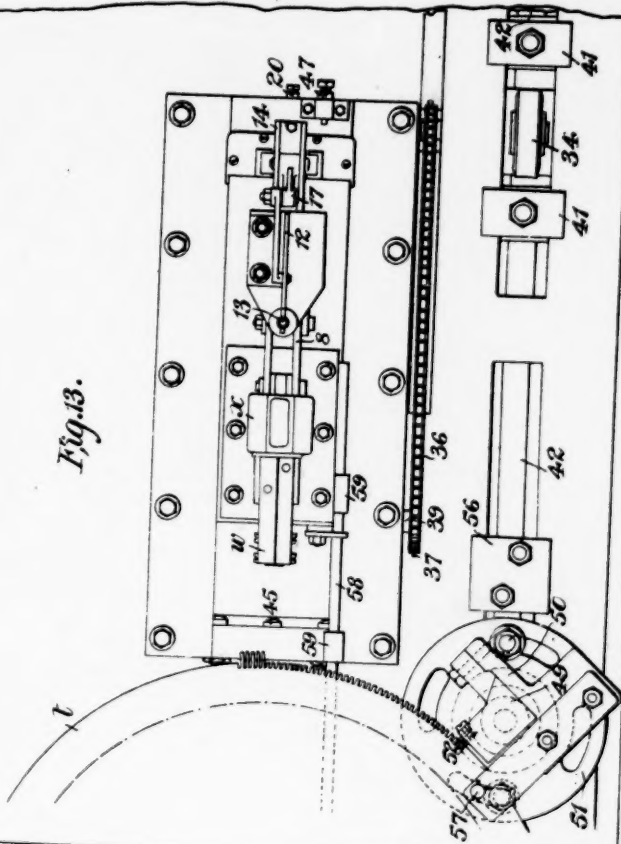
INVENTOR
SEBASTIAN Z. DE FERRANTI

By *John Morrison Harrison* Agent
ATTY

Granted Sept. 27-1904.

Div. 37

Fig. 13.

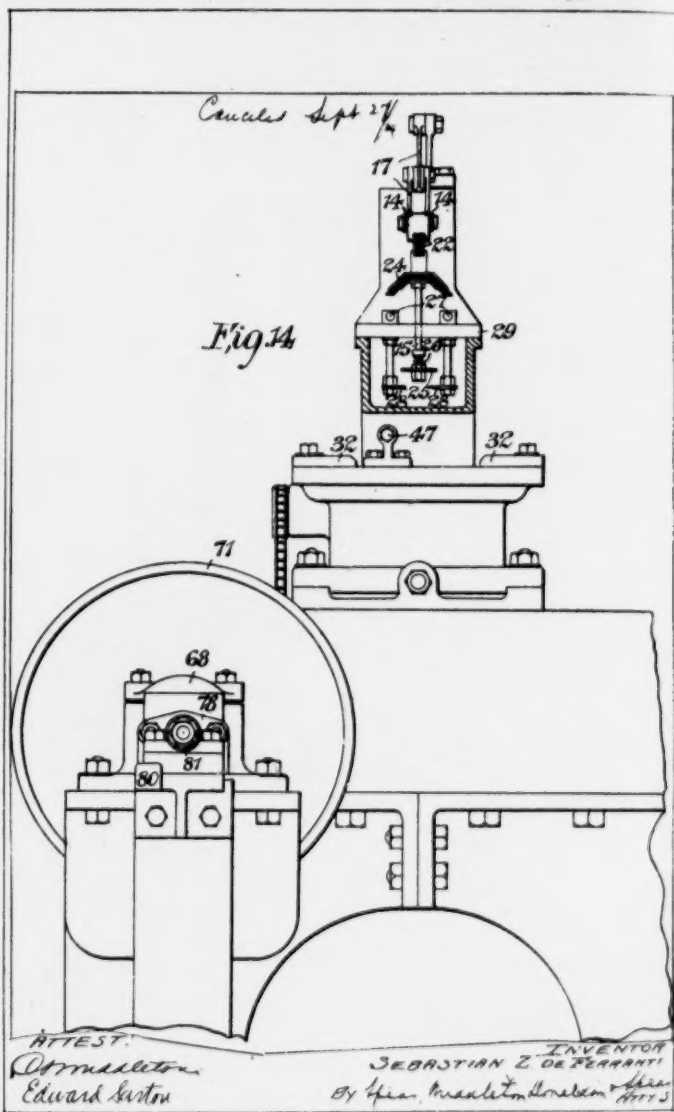


ATTEST:

Commissioner
Edward Barton

INVENTOR
SEBASTIAN Z. DE FERRANTI

By *Spec. Commissioner* *Commissioner*
ATTY.



Cancelled Sept 27-1904.

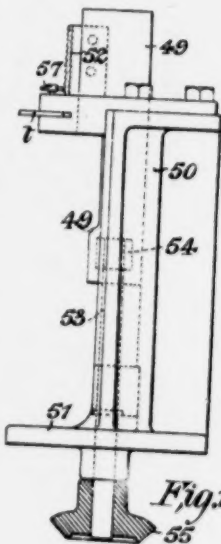


Fig. 16.

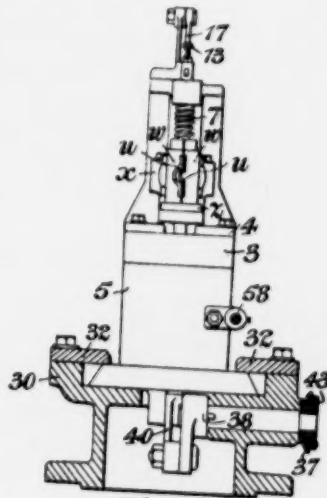


Fig. 15.

ATTEST:

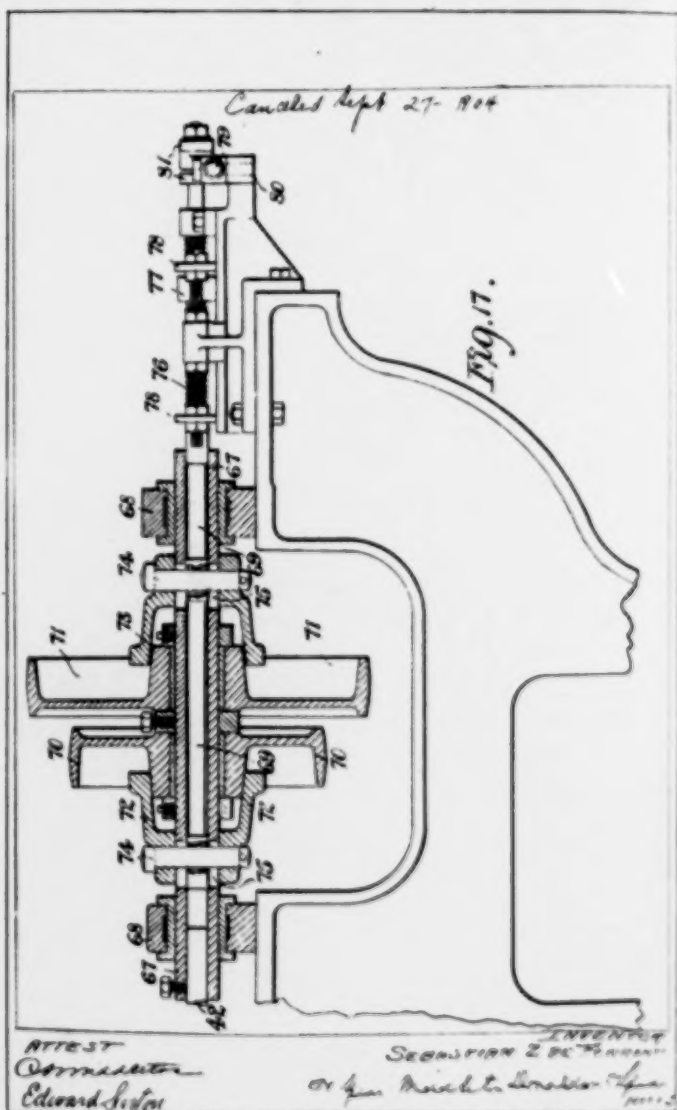
Edmund Barton
Edward Barton

INVENTOR

SEBASTIAN Z. DE FERRANTI

By *Spies, Mueseler, Smullen & Co.*

ATTY S



308,034
 2 Sheets

Canada Sept 27 1904

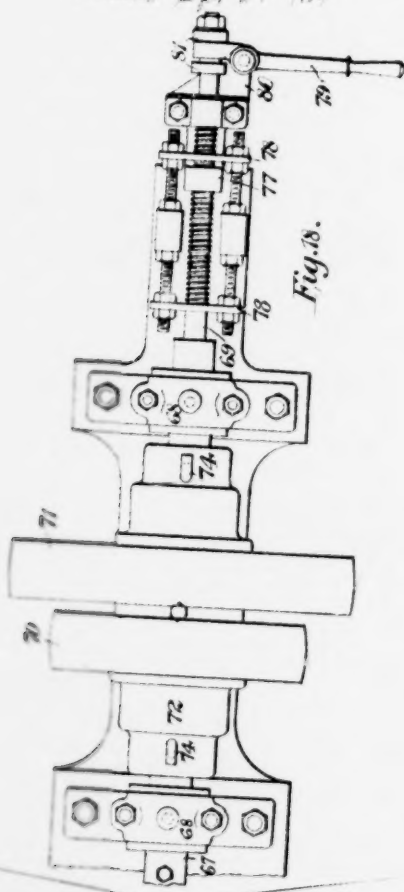


Fig. 18.

WITNESSES
 COMMISSIONER
 Edward - Wilson

INVENTOR
 SEBASTIAN Z. DE FERRANTI
 BY Spec. Inventor, Graham & Spear
 ATTYS

Granted Sept. 27. 1904

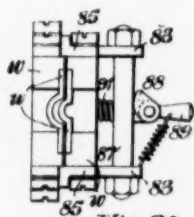


Fig. 20.

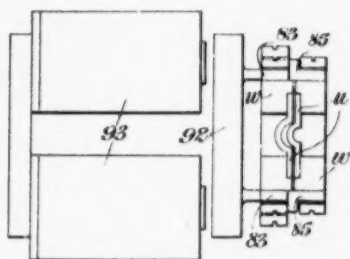


Fig. 22.

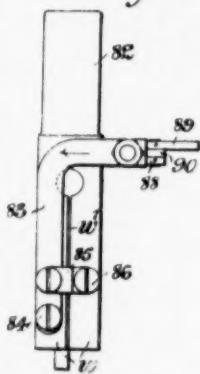


Fig. 19.

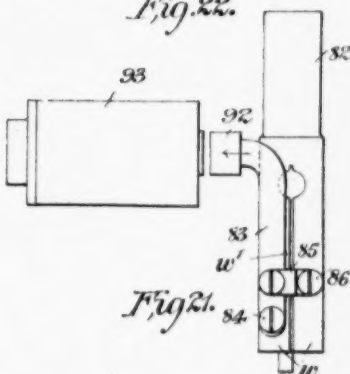


Fig. 21.

ATTEST
CORNELL
Edward Sartor

INVENTOR
SEBASTIAN Z. DE FERRANTI
BY *James M. Sullivan* Attorney
ATTY

CHART

TOO

LARGE

FOR

FILMING

15
658464 1323
APPLICATION FOR UNITED STATES PATENT

JAN 2 1912

Petition with Power of Attorney.

To the Commissioner of Patents:

Your petitioner SEBASTIAN ZIANI de FERRANTI,

Subject of the King of Great Britain and Ireland, and resident
of Grindleford Bridge, Sheffield, in the County of Derby,
England,

whose Post-Office address is Grindleford Bridge, Sheffield, in the
County of Derby, England,

prays that Letter Patent may be granted to him for improvement in
and relating to electric welding, (which he has divided out
from his main application Serial No. 208034 filed 14th May 1904)

as set forth in the annexed specification.

And he hereby appoints SPEAR MIDDLETON DONALDSON & SPEAR,
(Ellis Spear, Frank L. Middleton, Walter Donaldson & James M.
Spear,) of Washington D.C., Registration Number 6323, his

Attorney with full power of substitution and revocation, to prosecute this application, to make
alterations and amendments therein, to sign the drawings, to receive the Patent, and to transact
all business in the Patent Office connected therewith.

Signed at Sheffield England

this 16th day of December, 1911

Sebastian Ziani de Ferranti

TO ALL WHOM IT MAY CONCERN :

BE IT KNOWN THAT I, Sebastian Ziani de Ferranti,
a subject of the King of Great Britain and Ireland,
and residing at Grindleford Bridge, Sheffield, in the
County of Derby, England, have invented certain new
and useful "Improvements in and relating to electric
welding" of which the following is a specification:-

668464
2

This invention relates to electric welding and is a divisional application from my patent application Serial No. 208034.

In electric welding as at present practised, it is customary to arrange that the weld is formed over the whole of the juxtaposed surfaces of the parts being welded. The amount of current required varies of course with the extent of the contacting surfaces, and when these are large the difficulty in forming the weld and the cost thereof increases.

In many cases ~~for example, in sheet metal work~~ to form the weld over the whole of the opposing surface would be quite unnecessary and out of proportion to the strength required, and I have devised a method by the employment of which welds of the desired strength can be obtained ~~in the above and other~~ ~~manufactures~~ in an exceedingly economical manner.

My invention consists in the improved processes and articles to be hereinafter described.

Referring now to the accompanying drawings,

Figure 1 shows an edge view of a turbine, bladed element, the blades of which are welded in accordance with my invention.

Figure 2 is a part side elevation of the bladed element shown in Figure 1.

In carrying my invention into effect according to the form shown in the accompanying drawing, the turbine wheel or disc, *a*, has two intersecting sets of grooves, *b*, cut in the periphery thereof, so as to leave a series of projections, *f*, in the surface of the turbine wheel. The blade, *d*, is welded to certain of the projections, *f*, by passing across the points of contact

of the opposing surfaces, an electric current in a known manner.

It will thus be seen that on the completion of the welding operation the blades will be attached to the wheel or disc by a plurality of welds isolated from one another.

By my improved process it will be evident that considerable economy is effected in the cost of electrically welding the blade to the wheel or disc in comparison with methods at present in use.

I wish it to be understood that although I have described my invention as applied to the construction of a turbine wheel or disc, it is not limited to such, as it is of general application and may be applied in other circumstances where it is unnecessary or undesirable to form the weld over the whole of the contacting surfaces of the parts to be welded.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:-

1. A process for uniting two parts together consisting in utilising portions only of the individual juxtaposed surfaces for the transference of electric heating current so as to limit the heating effect of said current substantially to said portions and applying pressure so as to unite the parts by a weld of less area than that of the juxtaposed surfaces.

2. A process for uniting two parts together consisting in utilising portions only of the individual juxtaposed surfaces for the transference of an electric current the utilised portions being prepared so as to localise the heating effect of said current and applying pressure to unite the parts by a plurality of isolated electric welds.

1327

3. A process for uniting two parts together consisting in leading an electric current across portions only of the individual juxtaposed surfaces of the parts and applying pressure to said parts so as to integrally unite the individual juxtaposed surfaces together by a plurality of isolated electric welds.

4. A process for uniting two parts together consisting in forming projections on ^{one of} the individual juxtaposed surfaces of said parts leading an electric current across the parts by way of said projections and applying pressure to unite the individual juxtaposed surfaces by a plurality of isolated electric welds.

3 5. A metal article having component parts thereof united by a weld of less area than that of the juxtaposed surfaces.

6. Composite metal articles having individual abutting portions united together by a plurality of isolated welds.

7. A metal article having a plurality of current localising portions formed on one of its surfaces.

WP/LW.

1628

In testimony whereof I have signed my name to this specification the presence of two subscribing witnesses.

Sebastian Ziani de Ferranti

Witnesses:

- (1) Edward Knight Giatwick
(2) William Rance Davidson

OATH.

AMERICAN CONSULATE

SHEFFIELD

ST.

SEBASTIAN ZIANI DE FERRANTI,

the above named petitioner being duly sworn depose and say that he is a subject of the King of Great Britain and Ireland, and resident of Grindleford Bridge, Sheffield, in the County of Derby, England, that he verily believe in himself to be the original, first, and sole inventor of the improvements in and relating to electric welding, which he has divided out from his main application Serial No. 208024 filed 14th May 1904)

described and claimed in the annexed specification; that he do not know and does not believe the same was ever known or used before his invention or discovery thereof, or patented or described in any printed publication in any country before his invention or discovery thereof, or more than two years prior to this application, or patented in any country foreign to the United States on an application filed more than twelve months before this application; or in public use or on sale in the United States for more than two years prior to this application; and that no application for patent on said improvements has been filed by him or his representatives or assigns in any country foreign to the United States, except as follows: Great Britain No. 11921 filed 25-5-04, Switzerland filed 20-5-04, Austria filed 20-5-04, Germany filed 21-5-04, Belgium filed 26-5-04, Hungary filed 28-5-04, France filed 31-5-04, Russia filed 27-6-04, Canada filed 23-5-05, Japan filed 9-6-05 and Italy filed 27-7-05.

Sebastian Ziani de Ferranti

to and subscribed before me, this

16th

day of

December

1911

Rice K. Evans

(Notary Public for the United States of America)

VICE JC

United States of America.
Sheffield, England.

669464



Approved by
The Commissioner of Patents
Washington, D. C.

WLR/TAJ

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
WASHINGTON

Jan. 24, 1912.

S. Z. deFerranti,

Care Spear, Middleton, Donaldson and Spear,
City.

Please find below a communication from the EXAMINER in charge of your application.

686,464, filed Dec. 29, 1911----

Electric Welding.

E. B. Williams.

Commissioner of Patents.

Applicant calls this case a division of his application NO. 208,034, but it is found that this application page 2, lines 12 to 15, refers to welding sheets of metal together, face to face. There is no reference in the prior application to welding sheets, it being entirely limited to welding the ends of turbine blades to their carrier. For this reason this case is not a division of the prior case and is not entitled to the date thereof for the purpose of avoiding references.

Page 2, line 31, reference letter "r" is used but it is not found on the drawing.

Claims 5, 6 and 7 are for an article which is considered independent of an electric welding process such as set forth in claims 1 to 4 and they relate to a subject of invention which is separately classified from welding processes. Division is therefore required between claims 5, 6 and 7 and the remaining claims. It is not clear but that these claims are also barred in this application on account of applicant's patent 874,368, Dec. 24, 1907, Steam Eng. Rotary. There appears to be no line of division between these claims and claims in the patent.

1339

Major Nelson 2.

All communications respecting this
application should give the serial number,
date of filing, and date of invention.

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66541

Claims 1 to 4 are rejected upon each of the following patents-----

Mexium, 496,690, May 9, 1893, 219 - 10,
Kleinschmidt, 616,436, Dec. 20, 1898, 219 - 10,
Hunter, 690,958, Jan. 14, 1902, 219 - 10,

Fr. patent to Erel, 335,889, published Feb. 18, 1904, 219 - 10

Fr. patent to Erel, 336,187, published Mar. 1, 1904, 219 - 10.

Since as stated above applicant is not entitled to the date of the prior application referred to these claims are also rejected upon Br. patent Harnatta, 22,981, of 1903, 219 - 10, or Rietzel, 928,701, Jul. 20, 1909, 219 - 10.

WJ

W. J. Rich
Examiner, Div. 3.

65764
2

Room 175.
S. E. de Ferranti.
Serial No. 668464.
Filed December 29th, 1911.
"ELECTRIC WELDING".

To the Commissioner of Patents.

Sir

This amendment is in reply to the Official letter
of January 24th, 1912.

Page 2, line 11, erase "for example in sheet
metal work"

lines 16 and 17, cancel "in the above and
other manufactures"

As applicant has now erased the matter objected to
by the Examiner as being not present in the parent
application No. 668464, it is respectfully submitted
that the application as now amended is entitled to the
date of the parent application.

Cancel claims 5, 6 and 7 at present on file.

With regard to claims 1 to 4 which the Examiner
has rejected upon Menham, Fleinschmitt and Hunter, the
applicant would respectfully point out that none of
these citations appear to him to disclose a process of
welding in which two parts are united together by a weld
of less area than the juxtaposed surfaces.

With regard to Menham's Specification No. 418880,
the applicant would respectfully point out that when the
weld is finished according to the process in this
specification, it extends over the whole surface of
the juxtaposed surfaces. In evidence of this,
attention is called to Page 1, line 31, where it is
stated: "Figure 3 is a side view of a portion of a rail
formed from the two abutting ends of rails shown in

Figure 2 after welding." In the applicant's article when finished, however, the juxtaposed surfaces are not united over their whole area by the resulting weld, but are united by a weld of less area than the juxtaposed surfaces.

In view of this important difference between Moxham's process and the applicant's, the applicant respectfully submits that the claims as at present on file are clear of this reference.

With regard to Kleinschmidt's specification No. 616436, the applicant would respectfully point out that in this case also the weld is formed over the whole of the juxtaposed surfaces, and on Page 1, a confirmation of this statement will be found at line 53, where it is stated that: "Figure 3 shows a cross-section of a completed weld between two spliced bars and the rail taken on a line which would pass through one of the bosses b." From the figure it will be evident that the weld extends over the whole of the juxtaposed surfaces, and accordingly the applicant submits that the claims as at present on file are clear of this reference also.

With regard to Hunter's specification No. 690958, the applicant would point out that in this case the projections which are formed before welding, are melted off so that the molten metal spreads over the whole surfaces of the overlapping portions, and forms a complete weld, and Page 1, line 56, is cited as showing that a whole weld is formed between the overlapping surfaces, which states: "and as the metal in the immediate vicinity of the projections on the two plates melts, small lakes of molten metal are formed which quickly spread and unite, making a full transverse weld."

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It is evident from the processes disclosed in these three specifications, that in none of them is there any disclosure of the applicant's invention, as in each case it would appear that the whole of the juxtaposed surfaces are welded together. The applicant, however, unites the two parts together, not over the whole of the juxtaposed surfaces, but by a weld having an area of less extent than that of said surfaces. By this method he is enabled to weld two parts together by a series of welds which economize the amount of electric current used, and can be so arranged as to give the desired strength of weld.

In view of the great importance of this form of welding and the economy which it effects in the current, it will be evident that the applicant has effected a material advance upon the state of the art cited by the Examiner, and for this reason respectfully requests a reconsideration of the case.

Would the Examiner be good enough to insert the reference letter "f" in the drawing to designate the projections to which the blades, d, are welded.

With regard to the French patents to Egel, and the British patents to Haramatta, and Rietsel, the applicant would respectfully point out that as he has now eliminated from his specification the matter objected to by the Examiner as not contained in the parent application, he respectfully requests that these reference be discarded, as he claims the date of his British Patent Application, viz., May 25th, 1903, which is prior to the dates of these references.

Early allowance of the case is respectfully requested.

-2-

665464

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Respectfully,

3.2.4e Ferranti,

By

Spee Middleton Bowler Spee

ATTORNEYS.

Aug 30 '12

WB/LW.

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12

509

Project No. 4
All communications respecting this
application should give the serial number,
date of filing, and title of invention.

G. Z. de Ferranti, DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

WASHINGTON

Jan. 18, 1913.

G. Z. de Ferranti,

C/o Spear, Middleton, Donaldson and Spear,

City.

569,464, filed Dec. 29, 1911---

Electric Welding.

E. B. Moore

Replying to amendment filed Dec. 31, 1912.

Applicant has canceled the reference to the welding of sheet metal. This, in connection with the fact that the original case serial number 208,034, was limited exclusively to the welding of turbine blades, may be taken to warrant the position that the present claims in this case are either not warranted or must be construed to be for a different principle and process from that involved in the Rietzel and Harmetta case. The claims, therefore, while taken in the terms expressed, as broad enough to include these processes, are actually not considered to relate to the same type of process. They should be revised in this respect so as to bring out more clearly the idea involved in applicant's original disclosure, that is of the welding of two massive pieces of metal together but with surface contact less than the cross section of the pieces. Taken in this light the claims appear to be fully met by---Moxham, Kleinschmidt and Hunter of record. The patent to Perry, 575,039, Jan. 25, 1897, 39, Pences. Sub. 72, also meets the terms of these claims. The statement in applicant's remarks that the metal spreads over the whole surface

in Hunter's process
of the overlapped portions/is not considered accurate. It is
thought that the welding portion would form a line or strip
of less extent than the whole area of the overlapped portion.

Applicant's attention is called to the fact that if
he wishes to rely upon the date of a foreign application that
such application must be proven by filing a certified copy of
the application as filed, ex parte Pauling, 1905, C.D., 131.

MR

W. J. Rich
Examiner Div. 3.

668464
14

WLR/RAJ

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

WASHINGTON

Dec. 7, 1913.

Spear, Middleton, Donaldson and Greer,
Washington,
D.C.

Please find below a communication from the Commissioner of Patents.

C. Z. deFerranti, Electric Welding,
668,464, filed Dec. 29, 1911.

C. Z. deFerranti

Supplemental to Office letter of Jan. 16, 1913, appli-
cant's attention is called to---

Harmatta, 1,046,066, Dec. 3, 1912, 219 - 10,

In accordance with the the principle set forth in ex parte
if
Card and Card, 1904 C.D., 383, it is thought that/applicant is
found entitled to claims along the line of those in this patent
that an interference would be necessary between applicant and Har-
matta.

m.

Wm. J. Rich
Examiner, Division 3.

668,464
101



Room 175.
S. E. de Ferranti.
"ELECTRIC WELDING".
Serial No. 668464.
Filed December 29th, 1911.

To the Commissioner of Patents.

Sir,

This amendment is in reply to the Official letters of January 18th, 1913, and March 7th, 1913.

Applicant files herewith a certified copy of the British specification No. 11921 of 1903, showing the Provisional Specification as filed on the 15th of May 1903, the date which the applicant claims under the International Convention.

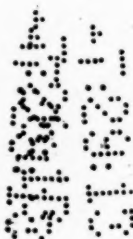
✓ Claim 4, line 2, after "on" insert "one of"

✓ Insert the following claims:-

5. A process of uniting two parts together consisting in forming one of the juxtaposed surfaces of said parts with relatively raised and depressed portions and leading an electric current across the parts by way of said raised portions and applying pressure to unite the juxtaposed surfaces by a plurality of isolated electric welds.

6. The hereinafore described improved method of fastening two pieces of metal together by electrically welding them to one another at spots only of their juxtaposed or opposite faces by the application of pressure and heating current localized in such spots.

7. The herein described method of uniting two pieces of metal at a number of distinct or separate spots separated from one another by well-



668464

defined areas of no union, consisting in applying pressure localized at the spots of desired union and passing electric current through the pieces from one to the other, while confining the flow of current to said spots until the union is effected.

8. The herein described method of uniting two pieces of metal, consisting in pressing them together while passing a heating electric current from one to the other and localising the flow of current and the heating throughout the operation in a spot or spots of circumscribed or limited area as compared with the area of the immediately opposed surfaces so as to limit the union of the pieces to a spot or spots.

9. The improved method of uniting two pieces of metal at a spot or spots only in their opposed meeting surfaces, consisting in pressing the two pieces together and passing a welding electric current from one to the other while localising the pressure in and confining the flow of current to the spot or spots of desired union, so as to produce an isolated spot or spots of union leaving distinct or well-defined areas in which the pieces are not welded together.

Claims 5 to 9 are claims 1 to 4 from Patent

Specification No. 1,046,066 to Hermatta, and the applicant respectfully requests that an Interference be declared with Hermatta, in order to decide the priority of the invention as stated in the above claims.

Respectfully,

S. Z. DE FERRANTI,

By

James H. H. H. H. H.
ATTORNEYS.



Consulate-General of the United States of America,
for Great Britain and Ireland, at London.

I, Richard L. Benson, Consul-General
of the United States of America for Great Britain and Ireland at London,
do hereby make known and certify to all whom it may concern, that the signature
subscribed to the annexed Certificate is of the
true and proper handwriting of Walter R. Evans, Comptroller General of
the Customs and Excise, London, England,
that the seal affixed to the said Certificate is the seal of the
and that to all acts signed as the annexed full faith and credit are and ought to be given in
England and thereon.

In testimony whereof I have hereunto set my hand and affixed
the Seal of the Consulate-General of the United States at London,
at London, this 10th day of April, 1911.



Richard L. Benson
Consul-General



PATENTS AND DESIGNS ACT, 1907.

IT IS HEREBY CERTIFIED by the Comptroller-General of Patents, Designs, and Trade Marks that the annexed are true copies of the provisional specification as lodged on the 26th May, 1903, in connection with de Ferranti's application for Patent No. 11,521 of 1903, filed on the 26th May, 1903, and of the complete specification and drawings as filed in connection therewith on the 26th February, 1904.

This certificate is issued for use in the United States of America.

Witness my hand this 3rd day
of April, 1912

W. T. Frankland
Comptroller-General of Patents,
Designs, and Trade Marks.

STATION BUILDINGS,
LONDON, W.C.



Date of Application, 25th May, 1903

Complete Specification Left, 25th Feb., 1904—Accepted, 25th Aug., 1903

PROVISIONAL SPECIFICATION.

"Improvements in and relating to ~~the~~ Electric Welding of ~~Parts~~
~~Blades~~."

I, SEBASTIAN ZIEMI DE FERRANTI, Engineer, of 41, Lyndhurst Road, Hampstead, London, N.W., do hereby declare the nature of this invention to be as follows:—

- The invention relates to improvements ^{in methods of electrically} ~~and relating to the electric~~ welding of turbine blades to the discs or drums carrying them, and has for its object to overcome the difficulties which have been experienced in electrically welding together the two parts which differ considerably as regards their power of rising to the required welding temperature when heated at the point of junction.
- The main difficulty arises through the blades and their carrying discs differing as regards their power of conducting heat away from the welding point.
- In the welding of a turbine blade to the disc, ring or the like to which it is to be secured it is found that the comparatively large volume of metal forming the disc rapidly conducts heat away from the welding point, thus preventing the temperature of the disc part rising to the required extent and causing an unsatisfactory weld.
- The invention, therefore, consists mainly in adjusting the volume of metal of the disc in the neighbourhood of the welding point so that approximately equal heating occurs in both faces to be welded, ~~whereby~~ turbine wheels with welded blades ~~may be~~ reliably produced in an inexpensive way.
- In carrying out my invention according to one modification grooves may be cut across the edge of the ring or several grooves may run circumferentially completely round the edge, or again intersecting sets of grooves inclined to one another may be cut on the edge of the ring.
- According to another modification, radial holes may be bored a short distance into the edge, either arranged in patterns so as to leave intervening projections or enched metal to which the blades may be welded or arranged without particular reference to the position of the blades.
- The object to be kept in mind in this as in other modifications is to remove sufficient metal to enable the temperature to rise to the welding point as explained above, while at the same time leaving sufficient areas untouched to ensure due mechanical strength in the welded joint.
- Again, the result aimed at may be secured by boring holes through from face to face of the ring at a radius slightly less than that of its outside edge.
- According to another modification of the invention, the ring may be built up of two or more thinner rings held in their relative positions by distance pieces or in any other convenient manner, the blades being then welded in position on their outside edges.
- Again, the ring may be built up of a set of thin laminæ, the edges of which are notched the laminæ being assembled in such a way that the notches

[Price 3d.]

Improvements in and relating to the Electric Welding of Turbine Blades

are "repped" with regard to each other, the intervening projections of metal being following the shape of the turbine blades to be welded to them.

Dated the 25th day of May 1903.

MARKS & CLERK.

18, Southampton Buildings, London, W.C.

13, Temple Street, Birmingham, and

30, Cross Street, Manchester,

Agents.

COMPLETE SPECIFICATION.

"Improvements in and relating to the Electric Welding of Turbine Blades."

I, SEBASTIAN ZIANI DE FERRANTI, Engineer, of 31, Lyndhurst Road, Hampstead, London, N.W., do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:

The invention relates to improvements in and relating to methods of electrically welding turbine blades to the discs, drums or the like carrying them and has for its object to overcome the difficulties which have been experienced in electrically welding together two such parts differing considerably as regards their power of rising to the required welding temperature when heated at the point of junction, so that blade carrying elements with welded blades may be reliably produced in an inexpensive manner.

The main difficulty arises through the blades and their carriers differing as regards their power of conducting heat away from the welding point.

In the welding of a turbine blade to the carrier to which it is to be secured, it is found that the comparatively large volume of metal forming the carrier rapidly conducts heat away from the welding point, thus preventing the temperature of the carrier rising to the required extent and causing an unsatisfactory weld.

The invention, therefore, consists broadly in adjusting the volume of the blade carrying element in the neighbourhood of the welding point, so that approximately equal heating occurs in both faces to be welded.

Referring to the accompanying drawings which, with the exception of Figure 1, show the invention applied, by way of example, to a type of parallel flow turbine in which the blades are mounted on the edge of a wheel-like body,

Figure 1 is a part side elevation of such a wheel having cross grooves,

Figure 1^a being an edge view;

Figure 2 shows a similar edge view of a modification in which sets of intersecting grooves are adopted;

Figure 3 shows an edge view of a form having circumferential grooves,

Figure 3^a being a section on the line A A of Figure 3;

Figure 4 shows, in longitudinal-sectional elevation, part of a drum carrier to which the blades are welded in accordance with one form of the invention;

Figures 5 and 6 show edge views of modifications in which holes are bored radially into the edge of the disc, while

Figure 7 is a part side elevation in which holes are bored through from face to face of the disc;

Figure 8 shows a sectional plan of a form of wheel built up of two dished discs, held apart at their circumferential portions by distance pieces,

Improvements in and relating to the Elastic Welding of Turbine Blades.

Figure 8 being a scrap edge view to a larger scale;
 Figure 9 is a similar sectional plan of a modified form of wheel built up of three discs, while
 Figure 10 is a corresponding scrap edge view also to a larger scale;
 Figure 11 shows a part sectional elevation of a wheel built up of two comparatively thick discs having notched edges,
 Figure 12 being a scrap edge view, while finally
 Figure 13 shows an edge view of a form of wheel built up of a series of "stepped" laminar.

It will be seen that all the edge views are shown as developments for clearness of drawing and not as true projections.

The same reference symbols are, when possible, used in the accompanying drawings to denote similar parts.

In carrying out the invention according to the form shown in Figures 1 and 1^a, the turbine wheel or disc is shown at *a*, cross grooves, *b*, being cut in its circumferential edge so as to leave projecting portions of metal, *c*, to which the turbine blades, *d*, are welded.

The same object is attained by cutting two intersecting sets of grooves, *e*, in the edge of the disc, as is shown in Figure 2, or by cutting circumferential grooves, such as *f*, completely round the edge (see Figures 3 and 3^a.)

Figure 4 shows the invention, according to one form, applied to the case of a drum blade carrier, *a*¹; the drum is grooved circumferentially with grooves, *b*, the intervening collars of metal being then cross-cut to form projecting teeth, *c*, on which the blades are welded.

According to a modified form, radial holes, *k*, may be bored a short distance into the edge of the disc, these holes being either arranged in patterns so as to leave intervening projections of untouched metal to which the blades may be welded as shown in Figure 5, or arranged without particular reference to the position of the blades, (see Figure 6).

In Figure 7, a method is shown of removing metal in the neighbourhood of the welding point by boring holes, *l*, through (or partly through) from face to face of the disc at a radius slightly less than that of its outside edge.

The object to be kept in mind in this as in other modifications, is to remove sufficient metal to enable the temperature to rise to the welding point as explained above, whilst at the same time leaving sufficient areas untouched to ensure due mechanical strength in the welded joint.

Referring now to Figures 8 and 8^a, a form of wheel is shown somewhat diagrammatically which is built up of two dished discs, *k*, of comparatively thin metal, held apart at their circumferential portions by one or more distance pieces such as *l*, disposed at a radius somewhat less than the maximum radius of the discs, the blades, *d*, being welded in position on their outside edges.

Figures 9 and 9^a show a type of wheel generally similar to that last described but having an intermediate plane disc, *m*, in addition to the two dished discs, *k*; a portion, *n*, of the hub, *a*, in this case made detachable so as to allow the different parts of the wheel to be assembled. Distance pieces, *l*, are indicated as before but any other convenient method of holding the discs in their correct relative position may be adopted.

In Figures 8 and 9, the dished discs, *k*, are indicated as secured to the hubs, *a*, by pressing the inner edges of these discs into grooves and subsequently welding over the hubs to hold the discs in place.

In the modification shown in Figure 10 and 10^a two dished discs, *k*, are again employed but of thicker metal, their circumferential portions being brought into contact and cross grooves, *b*, being cut in their edges in accordance with the method described above with reference to Figures 1 and 1^a.

Another modification of the disc carrying the blades, may be built up of a set of thin laminar, *e*, (see Figure 11), the edges of which are notched as at *s*, the laminar being assembled in such a way that the notches, *s*, are "stepped"

Improvements in and relating to the Electric Welding of Turbine Blades.

with regard to each other, so that the interlocking projections of metal may follow the shape of the turbine blades to be welded to them.

Instead of welding the laminar, they may be prepared in accordance with other of the methods pointed out above, before being assembled in the manner indicated.

In an invention such as the present, it is not practicable to describe every method of carrying its broad underlying principle into effect, but the scope is sufficiently indicated by the many examples given above, and moreover it will be evident without further description, how the invention may be applied to the welding together of turbine blades and carriers of other kinds than those described above by way of example.

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. In turbines, the method of welding the turbine blades to the element carrying them, consisting in so adjusting the volume of metal in the blade carrier in the neighbourhood of the welding point, that approximately equal heating occurs in the two parts, substantially as described.
2. In turbines, blade carrying elements having blades welded thereupon in accordance with the method claimed in Claim 1.
3. In turbines, grooving the blade carrier in the neighbourhood of the welding point, substantially as and for the purpose described.
4. The bladed turbine element, hereinbefore described with reference to Figures 1 and 1* of the accompanying drawings.
5. The bladed turbine element, hereinbefore described with reference to Figure 2 of the accompanying drawings.
6. The bladed turbine element, hereinbefore described with reference to Figures 3 and 3* of the accompanying drawings.
7. The bladed turbine element, hereinbefore described with reference to Figure 4 of the accompanying drawings.
8. In turbines, forming holes in the blade carrier in the neighbourhood of the welding point, substantially as and for the purpose described.
9. The bladed turbine element hereinbefore described with reference to Figures 5 and 5* of the accompanying drawings.
10. The bladed turbine element, hereinbefore described with reference to Figure 6 of the accompanying drawings.
11. In turbines, welding the blade carriers of comparatively thin parts across the non-touching edges of which the blades are fixed, substantially as described.
12. The bladed turbine element, hereinbefore described with reference to Figures 8 and 8* of the accompanying drawings.
13. The bladed turbine element, hereinbefore described with reference to Figures 9 and 9* of the accompanying drawings.
14. The bladed turbine element, hereinbefore described with reference to Figures 10 and 10* of the accompanying drawings.
15. In turbines, building the blade carriers of prepared laminar assembled in a "clipped" manner, substantially as and for the purpose hereinbefore described.
16. The bladed turbine element, hereinbefore described with reference to Figure 11 of the accompanying drawings.

Dated this 25th day of February, 1904.

MAHER & CLEEK,
18, Southampton Buildings, London, W.C.
13, Temple Street, Birmingham, and
30, Canal Street Manchester,
Agents.

Printed by H.E. Mapley's Stationery Office, by Love & Malcomson, Ltd.

(4, 8710-50-7/1903)

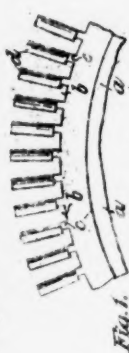


Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.



Fig. 5.



Fig. 6.



Fig. 7.



Fig. 8.



Fig. 9.



Fig. 10.

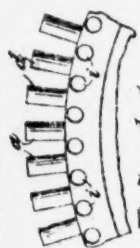


Fig. 11.

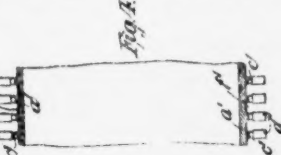


Fig. 12.



Fig. 13.



Fig. 14.



Fig. 15.

[This Drawing is a reproduction of the Original on a reduced scale.]

INTERFERENCE.

Interference No. 5709

Paper No. 7

Name, Sebastian G. de Ferranti

Serial No. 668464

Title, Electric Welding

Filed, Dec. 29, 1911

Interference with Johann Varnalla

DECISIONS OF

Primary Examiner,

Dated,

Ex'r of Interferences, Adams

Dated, March 18/18.

Board,

Dated,

Decision,

Dated,

REMARKS:

668464
23

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

1318

Oct. 2, 1913
WLR/RAJ

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C.

Paper No. 8
[INTERFERENCE]

263

Spear, Middleton, Donaldson and Spear,
Washington, D.C.



Have had before me of a communication from the Examiner concerning the
application of Sebastian Ziani de Ferranti, for Electric Welding,
filed Dec. 29, 1911, Ser. No. 668,464.

Very respectfully,
No. 175

Very respectfully.

E. B. Smith
Commissioner of Patents

6709

The case, above referred to, is adjudged to interfere with others, hereafter specified,
and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before
DEC 1 1913

with the subject of the invention, and names of
every person it, entered on the envelope. The subject-matter involved in the interference of

1. The hereinbefore described improved method of fastening two pieces of metal together by electrically welding them to one another at spots only of their juxtaposed or opposite faces by the application of pressure and heating current localized in such spots.
2. The herein described method of uniting two pieces of metal at a number of distinct or separate spots separated from one another by well-defined areas of no union, consisting in applying pressure localized at the spots of desired union, and passing electric current through the pieces from one to the other while confining the flow of current to said spots until the union is effected.
3. The herein described method of uniting two pieces of metal, consisting in pressing them together while passing a heating electric current from one to the other and localizing the flow of current and the heating throughout the operation in a spot or spots of circumscribed or limited area as compared with the area of the immediately opposed surfaces so as to limit the union of the pieces to a spot or spots.

668464
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4. The improved method of uniting two pieces of metal at a spot or spots only in their opposed meeting surfaces, consisting in pressing the two pieces together, and passing a welding electric current from one to the other while localizing the pressure in and confining the flow of current to the spot or spots of desired union so as to produce an isolated spot or spots of union, leaving distinct or well-defined areas in which the pieces are not welded together.

The interference involves your application for Electric Welding, application above identified and a patent/granted to Johann Harmatta whose post office address is Szepesvaralja, Austria-Hungary, whose assignee is the Thomson Electric Welding Co., Lynn, Massachusetts and whose attorney is O. F. Duffy and Son, 612 F. St., N.W., Washington, D.C.

The relation of the counts of the interference to the claims of the respective parties is as follows:---

Counts	De Ferranti	Harmatta,
1	3	1
2	7	2
3	8	3
	9	4

Wm J Rich
Examiner, Division 3.

1350

668464 - 9

Ear, Middleton, Donaldson & Spear
ATTORNEYS IN PATENT CASES
AMERICAN AND FOREIGN
VICTOR BUILDING

ELLIS SPEAR (1870-1917)
FEDERALLY REGISTERED PATENT
F. L. MIDDLETON
WALTER DONALDSON
JAMES W. SPEAR
WILLIAM F. WALL
1415 K STREET, N.W., WASHINGTON

RECEIVED
JUL 15 1917
U S PATENT OFFICE

WASHINGTON, D. C. July 14, 1917.

Hon Commissioner of Patents,
Washington, D. C.

CHURCH'S CHURCH
JUL 15 1917
WASHINGTON, D.C.

S I R :-

We request that you recognize Mr. Melville Church as our
associate in the matter of the application of Sebastian S. de Ferras-
ti, serial number 668464, filed December 29, 1911, and in the
Interference No. 78709 in which said application is involved.

Very respectfully,

James W. Spear

RBO

1912

1351

CONTENTS:

Print *Dec 21-1912*

1. Application papers.	26. 1.....
2. <i>Jan. 21, 1912</i>	27.
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5. <i>March 1, 1913</i>	30.
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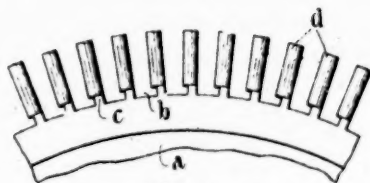


Fig. 1.

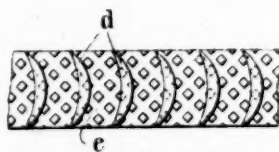


Fig. 2.

Witnesses.
C. Parsons
J. B. Smith

Inventor:
John William Parsons & Co.,
of San Francisco, Cal.
Attorney.

No 32

UNITED STATES OF AMERICA,

DEPARTMENT OF THE INTERIOR,

UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

THIS IS TO CERTIFY that the annexed is a true copy from the
Records of this Office of the File Wrapper, Contents and Canceled
Drawings in the matter of the

Letters Patent of

Johann Harmatta, Assignor to

Thomson Electric Welding Company,

Number 1,046,066.

Granted December 3, 1912,

for

Improvement in Electric Welding.

TESTIMONY WHEREOF I have hereunto set my hand
and caused the seal of the Patent Office to be affixed
at the City of Washington, this 11th day
of August, in the year of our Lord one
thousand nine hundred and seventeen and of
the Independence of the United States of America the
one hundred and forty-second.



James H. ...
Acting Commissioner of Patents.

Case 1

2-487

NUMBER (SERIES OF 1900).

183,677

1903

47

PATENT No. 1046066

DIV. 8 13 37 26 3

(EX'R'S BOOK) 15 235/9

2- 3.

Name Johann Harmatta

Assor to Thomson Electric Welding Company, of Lynn,
Mass. a corp. of Mass

, 190

of Szepesvaralja

County of

State of Austria-Hungary

Invention Electric Welding

, filed

ORIGINAL.		RENEWED.
Petition	Dec 3 , 1903	, 19
Affidavit	" " , 1903	, 19
Specification	" " , 1903	, 19
Drawing	" " , 1903	, 19
Sp. Dfg.	May 14, 1904.	, 19
Model or Specimen	Jan 27, 1910	, 19
First Fee Cash \$15.	Dec 2 , 1903	, 19
" ✓ Cert.	, 190	, 19
Appl. filed complete	Dec 3 , 1903	, 19
Examined Oct. 28, 1912, Wm. J. Rich	Exr.	, 19
Countersigned W. W. Mortimer.		, 19
Notice of Allowance	For Commissioner Oct. 31 , 1912	For Commissioner. , 19
Final Fee Cash \$20	Nov 5 , 1912	, 19
" " Cert.	, 190	, 19
Patented	December 3 , 1912	, 1912
Associate Attorney	O. E. Duffy & Son, Attorney	Marion & Marion-
	612 F St., N.W.	Montreal-
	Washington, D.C.	Canada-

Name

Serial Number

Patent No.

Date of Patent

183,677

MAIL ROOM
DEC 3 1903
U.S. PATENT OFFICE

Case 1

183,677

DIV. 37. PAPER NO. 1

PETITION and POWER.

To the Commissioner of Patents,

UNITED STATES of AMERICA.

Your Petitioner Johann Harmatta Engineer, a subject of the King of Hungary residing at Szepesvaralja, in the Kingdom of Hungary prays that Letters Patent of the United States be granted to him for the Improvements in Electric Welding set forth in the annexed specifications:

And he hereby appoints Messrs Marion and Marion (J.A.Marion & J.Wilfrid Marion) of Montreal, Province of Quebec, Canada, and Washington, D.C., U.S.A., his Attorney with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to sign his name to the drawings, to receive the Letters Patent when issued, and to transact all business in the Patent Office connected therewith.

Signed at Budapest, Hungary this 5th day of November, 1903

Johann Harmatta

Address Communications to
MONTREAL OFFICE

Specification.

To all whom it may concern:

Be it known that I, J o h a n n H a r m a t t a, Engineer, a subject of the King of Hungary, residing at S z e p e s v a r a l j a, in the Kingdom of Hungary, have invented new and useful "Improvements in Electric Welding", of which the following is a specification.

My invention relates to a process of and apparatus for manufacturing metal articles of all kinds, in particular those of the thinnest sheet metal, by direct electric welding. The new process consists in one of the electrodes (or both of them) not only serving to feed the current, but also being employed for exercising a more or less strong pressure either before and during the period of supplying the electric current, or only at the moment of this supply, at the place at which the welding is to be done. The member which feeds the electricity is thus at the same time the tool, and in this manner the most favorable con-

Cancelled-per
Sub.-Spec.-
May-14,-1904.

Sub. K¹

1357

ditions of working possible are secured, since, as is well known, in really effective welding processes the place of welding brought to the proper temperature must be at once well hammered or pressed in order that the welding may be thorough.

According to none of the present known electric welding processes are the articles to be welded firmly pressed together during the welding operation by one or both electrodes, for the purpose of favoring welding. Hitherto either no pressure has been exerted at all, or it has been exercised at a certain distance from the place of welding, or at all events not centrally direct upon the electrodes pressing on the place to be heated. In short, hitherto direct electric welding pressure has never been exercised by means of the electrodes located in the direction of the current directly above the surface or point being welded.

For carrying out the new process various apparatus may be employed, as the necessary pressure may be exerted at the place of welding by the aid of any of those technical means which are suitable for producing or transmitting pressure; e.g., with a press either direct or by means of indirect transmission by levers. Or it may be by means of simple hand levers, that is to say, by means of direct or indirect manual power.

In the accompanying drawing

Fig. 1 is a view illustrating the welding of

two metal sheets of equal thickness, intermittently or at certain spots only.

Fig. 2 is a front elevation and

Fig. 3 a side elevation of a device which may be employed for continuous welding, the pressure being exerted by roller electrodes, whereby the advancing series of single points of the seam to be welded is united to a whole with a minimum consumption of current.

Fig. 4 illustrates the method of welding the longitudinal seam of a cylindrical or conical hollow article according to my new process.

Fig. 5 is a side elevation of a welding device (also illustrated in part in Fig. 1) according to which the pressure is exercised by pin shaped electrodes, the form of which may be suited to the particular purpose in view, and which may be adapted to work on the smallest possible surface of contact.

Fig. 6 shows two forms which may be adopted for the ends of the contacting electrodes.

As Fig. 1 shows, the two sheet metal or other bodies, the edges of which lie upon each other, are introduced between the two electrodes a b. Of the latter the one, somewhat prior to welding or only during the welding operation, is pressed upon the other, as the arrow shows; or both electrodes may be caused to exert pressure on the objects to be welded.

For continuous welding of longitudinal, cross and circular seams, the device shown in Figs. 2 and 3 of the drawing may be advantageously employed.

In the two conductors a d (Fig.3), forked members e f, making intimate contact with the conductors, are introduced, each furnished with a removable roller electrode g and h; or, if desired, only the lower roller electrode, for instance, may be capable of being removed. Or the lower or upper electrode may be formed as movable roller and the other electrode forms a stationary conductor.

The roller g of the upper conductor a is keyed to an axis i carrying a spur wheel k to which the motion of a suitably mounted hand-wheel l can be transmitted by means of a spur wheel m. Or the hand-wheel may be mounted directly on the shaft g, without the use of any intermediate gear-wheels. Or the axis i may have on the other end also a spur or bevel wheel, or pulley or the like for driving the roller electrode g, should it be desired to automatically advance the object being welded by means of motor power. The purpose of the hand-wheel is to accelerate or decrease the speed of rotation of the roller g, as may be required, and in general to actuate the roller by hand for any purpose. The axis i may, of course, be caused to move slower or faster in the case of mechanical power, by any other suitable means. The

upper part of the fork carrying the electrode roller g is here shown as constituting a toothed rack n, in which engages a pinion p carried by the conductor q by means of a ring-holder o. The pinion p is keyed to the axis g, which carries a hand lever r at its outer end. By raising or depressing the lever r, the upper roller electrode g may be separated from or advanced towards the lower roller electrode h. Furthermore by raising or depressing the forked piece f in the conductor d the lower removable roller h may be adjusted higher or lower.

If now the ends of the objects to be welded are introduced between the two roller electrodes g h and the circuit closed, continuous welding may be undertaken, that is to say an uninterrupted welded seam made, whereby the upper rotary roller electrode g may be pressed with any required degree of pressure upon the lower stationary (or rotary) roller electrode h, so that the two ends of the material to be welded are firmly connected with each other.

Instead of the objects to be welded being introduced gradually between the electrodes, the electric welding apparatus may be arranged to slide relatively to the stationary objects.

Thus if it is required to weld, for instance, sheets of metal only at particular places, the apparatus shown in Fig. 5 may be advantageously employed,

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the electrodes a b having the form of pins. The lower electrode b is then inserted in the conductor d, whilst the upper electrode a is carried by an arm g by means of a hand-lever t carried by said arm g and can be turned on the shaft u in such manner that the points of the electrodes a b approach and recede from each other. If then two superposed sheet metal ends to be welded together are introduced between the electrodes, and the latter then firmly pressed together and the circuit closed, a small round, very sharply defined place of welding is caused which perfectly answers the purposes of a rivet. In this event, also, especially in the case of thin vessels which are not required to withstand great pressure, the pressure on the place of welding may act at the right moment be exactly regulated or kept within the proper limits.

Having thus described my invention, what I claim as new and desire to secure by letters patent is :-

1. The process of electric welding, consisting in employing the electrodes not only to conduct the current to the objects being welded, but also to exert a regulable pressure on the same, substantially as described.

2. An electrode apparatus for electric welding, comprising two electrodes between which the objects to be welded are introduced, and means whereby one of the

electrodes can be approached to and receded from the other, substantially as described.

3. An electrode apparatus for electric welding comprising two roller electrodes between which the objects to be welded are introduced, and means for pressing the electrodes to the work, substantially as described.

4. An electrode apparatus for electric welding, comprising two roller electrodes between which the objects to be welded are introduced, means for pressing the electrodes to the work, and means for rotating one or both of the rollers for the purpose of advancing the work in its path between the electrodes, substantially as described.

1332

In Witness whereof I have hereunto signed my name
this 5th day of November, 1903, in the presence of two
subscribing witnesses.

Johann Harmatta

Witnesses :

Carl Becker

F. LaGuardia

A f f i r m a t i o n .

UNITED STATES CONSULATE;
BUDAPEST, HUNGARY.

Johann Harmatta, the above named petitioner being duly affirmed, deposes and says that he is a subject of the King of Hungary, and resident of Szepesvarálja, in the Kingdom of Hungary, and that he verily believes himself to be the original, first and sole inventor of the Improvements in Electric Welding, described and claimed in the annexed specification; that he does not know and does not believe that the same was ever known or used before his invention or discovery thereof; or patented, or described in any printed publication in any country before his invention or discovery thereof, or more than two years prior to this application;

1364

or patented in any country foreign to the United States on an application filed more than twelve months before this application; or in public use, or on sale in the United States for more than two years prior to this application, and that no application for patent for said improvement has been filed by himself or his legal representatives or assigns, in any country foreign to the United States, except as follows: Germany, March 24th, 1903; Sweden, October 12th, 1903; France, October 13th, 1903; Austria, October 14th, 1903; Denmark, October 14th, 1903; Hungary, Oct. 15th, 1903; Switzerland, October 16th, 1903; Belgium, October 16th, 1903

Johann Hamatta.

Affirmed to and subscribed before me this fifth day of November 1903.

Frank Dyer Chester

N.E. 360
1903.

United States Consul.



Div. Room No. 17 J 2-200

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

Paper No. 1

All communications respecting this
application should give the serial number,
date of filing, title of invention, and
name of the applicant.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

WASHINGTON, D. C., January 9, 1904.

MAILED

Johann Harmatta,

C/o Marion & Marion,

Montreal, Canada.

your

Please find below a communication from the EXAMINER in charge of ~~the~~ application of.

\$183,677, filed Dec. 3, 1903, for Electric Welding.

F. I. Allen.

~~XXXXXXXXXXXXXXXXXXXX~~
Commissioner of Patents.

The statements beginning in line 6, page 2, should be amended or canceled in view of the references to be hereinafter cited.

Division is required in this case as between claim 1 which is drawn to cover a process, and the remaining claims which cover an apparatus. Claim 1, however, does not appear to be a proper process claim but simply covers the functions of the apparatus. If this claim is retained in its present form the requirement for division will be insisted upon. The statement of invention should be made to conform to whichever subject matter is covered by the claims retained in the case.

Claim 2 is rejected on each of the following patents:

Burton et al., 486,626, Nov. 22, 1892,
Burton, 647,694, Apr. 17, 1900,
Anderson, 657,262, Sept. 4, 1900,
Duncan, 660,152, Oct. 23, 1900,
Perry, 670,808, Mar. 26, 1901, Metal Working, Electric.

Claims 3 and 4 are rejected on Burton et al., cited. To apply
which
the power directly to the shaft upon the roller electrode is support-
ed, does not involve invention.

W.J.S.

A. F. Kinnan Ex

1366

MAIL ROOM
MAY 14 1904
U.S. PATENT OFFICE

DIV. 37 PAPER NO. 2
Sub. Spec.

(PRINTED LETTER HEAD OMITTED)

MONTREAL,
May 10th, 1904.

IN THE UNITED STATES PATENT OFFICE, ROOM 107, (
APPLICATION OF JOHANN HARMATTA, }
ELECTRIC WELDING, } AMENDMENT
FILED DECEMBER 3, 1903, SERIAL NO. 183,677. }

HON. COMMISSIONER OF PATENTS,

WASHINGTON, D. C.

SIR:-

Referring to the Office action of
January 9th, 1904, we hereby amend as follows:

Cancel the entire specification and claims
with the exception of the preamble and signatures, and
insert the following.

Sub. Spec.
May 14, 1904.

The subject of my invention is a process of welding thin sheet metal by means of electricity.

As is well known, it is impossible, by means of the ordinary methods of electric welding, to produce a really sound seam between very thin metal from about two millimeters in thickness downward sheets, that is to say, a seam which is perfect at every part, without there being any fusing or burning away of the material being welded.

The reason of this I have ascertained to be as follows:-

On the ordinary systems of welding it is the practice at once to lead a current to the objects to be welded (such as iron bars, hoops, chain links, or the like), whereby, in consequence of the thinner or thicker layer of air, which is always present between the two objects, vigorous sparking occurs. There is, so to say, a line of sparks or an arc formed, which persists until the objects being welded have been brought to welding heat by the electric current, whereupon they are finally pressed together to effect the desired union.

This well-known method, therefore, does not really differ from the ordinary method of welding

at the fire, except that instead of the gases of combustion of the fuel, the electric current is employed to heat the bodies to be welded. Once the welding heat is reached, however, the final union of the bodies in either case is effected by mechanical pressure (pressing or hammering).

For the purpose of enabling my invention to be more readily understood, I will make reference to the accompanying drawing, in which

Erased
per C

Fig. 1 is a sectional view illustrating the electric welding of two comparatively thick sheets on the ordinary system.

Fig. 2, is a like view showing what occurs when one of the sheets is thin.

per C

¹
Fig. 3 is a section of portions of two thin sheets with an air-gap between them.

²
Fig. 4 is a sectional view illustrating the employment of my new process in welding thin sheets.

³
Fig. 5 is a like view showing the welding of the overlapping ends of two pieces of sheet metal.

In known processes
As Fig. 1 shows, the electrodes 1 & 2 lie opposite each other, the sheets 3, 4 to be welded by the ordinary process being located between them. The sheets lie loosely upon each other, that is to say, they are not artificially pressed together, and the consequence is that, that they are separated by a layer of air 5.

If now the electric circuit is completed

1369

through the two electrodes and the sheets, and if the layer of air 3 is sufficiently thick, that is to say, the air resistance sufficiently great, there will be no sparks or arc formed between the two plates for the time being. If, however, the sheets are approached, as is unavoidable for the purpose of final union by pressing, hammering, etc., as already explained, a time must arrive when the air resistance between the two sheets to be welded is no longer sufficiently great to prevent equalisation of the electricity at the two poles. Between the sheets, therefore, an arc or a line of sparks will be formed, and will continue until intimate contact has taken place between the two sheets. If, as is shown in Fig. 1, the sheets are relatively thick, the arc which is formed will be of no consequence, since the slight fusing away at 4 caused by the arc, or the sparks, will not be sufficiently deep to penetrate the thick material. In fact there is even an advantage in the action of the sparks or arc in the case in question, since the cross section of the material is altered, whereby the two sheets are, as it were, scarfed at the place of welding, that is to say, the two cross sections are diminished at the seam to approximately the thickness of a single sheet, so that under certain conditions the two welded sheets have the same thickness at the joint as a single sheet.

The case is altogether other when two thin sheets or articles are to be welded, or when a very thin object is to be welded to a thicker one, such as is shown, for instance, in Fig. 2. In this Figure it is assumed that the thick sheet 2 (which, as explained with reference to Fig. 1, is thick enough not to be penetrated completely by the arc at the point 4) is to be electrically welded to a very thin plate 5 by the ordinary process as above explained.

On the approach of the objects 2, 5, at a certain moment, in consequence of the penetration of the layer of air 3, fusing away takes place at 4, owing to the arce or sparks, and this fusing will extend to such depth that, although, as above explained, not injurious in the case of the sheet 2, it causes the thin sheet 5 to be completely perforated or burnt through. Thus the ordinary process of welding by means of an arc is quite impracticable with such thin sheets.

per A

The essential feature of my invention is that from about two millimeters in thickness downward in welding thin sheets the formation of such an arc, or sparking distance, which proves so disastrous, is wholly avoided, whereby a perfectly sound welded joint between such bodies, or between a very thin body and a thicker object, is attained.

For the purpose of preventing the formation of the injurious arc, that is to say the sparking

distance, I first submit the superposed metal objects to be welded 5, 6 (Figs. 4 & 5) to a certain pressure, the amount of which will depend upon the nature of the said objects. This pressure I effect by means of the electrodes a b (Figs. 4 & 5) themselves, or with the aid of other suitable means. The purpose of this pressure is to bring into intimate contact the parts of the metal to be united, so that the layer of air between them is as far as possible expelled. In this manner the two parts to be welded are, as it were, mechanically connected to form a single homogeneous body. This is of great importance when the two very thin sheets are to be welded together. For, as is well known, thin sheets have always a more or less wavy form, so far as they have not been straightened in the process of manufacture so as to present a surface which is practically quite flat, such as is the case with thick sheets. Such thin sheets, therefore, unless submitted to mechanical pressure never lie close upon one another; on the contrary, in consequence of the wavy form, large air-gaps 3 (Fig. 3) are left between them, so that if a current were led through them, it would aid sparking and the formation of arcs.

After the two metal objects have, therefore, been prepared in this way, that is to say, by the application of mechanical pressure caused to lie closely upon each other, without any air-gap, between

them, the electric circuit is closed, the mechanical pressure being still maintained.

At the place where the electrodes a b exert pressure, therefore, (Figs. 4 & 5), that is to say, where the current is able to flow through the bodies to be welded without having to pass through a layer of air and form sparks, the metal is heated to welding heat. Immediately this temperature is reached, the continuous pressure effects the desired union, that is to say, welding of the two metal objects 5 and 6, without injury by perforation or burning, in the manner explained, having taken place, even if the sheets are extremely thin. It should be remarked that the pressure to be exercised on the bodies before and during welding, must be selected according to the thickness of the sheets, and can be adapted to suit the condition of the bodies for the time being. Thicker sheets or objects do not require so much pressure as thin ones because, as already explained, they have a more even, uniform shape and therefore when laid upon each other can be readily closed together, that is to say pressed so that no injurious air-gap is formed.

Since the essential condition is, that the two metal objects to be united are firmly pressed together before welding, in order that complete penetration of the thin body by the electric current may be avoided, it is obvious that with this process

not only two equally thin sheets, but a very thin sheet and a thicker metal object may be welded without danger of the former being burnt through.

Naturally the required super-ficial pressure may be exerted by only one electrode, or by both the electrodes.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:-

The process of electrically welding thin sheets and the like, consisting in applying pressure at the place of welding of the two superposed metallic objects to be united, for the purpose of effecting thorough superficial contact between them, and then, whilst maintaining the said pressure, heating the objects by passing an electric current through them, substantially as described.

Cancel the drawing originally filed and substitute the one accompanying this specification.

REMARKS.

It is hoped that this amendment will place the application in condition for allowance.

RESPECTFULLY SUBMITTED,

Marion & Marion

ATTORNEYS.

M. / M.

1374

Div. 37 Room 197

J

2-280

Paper No. 3

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

If communication respects an invention,
applicant should give the serial number,
date of filing, title of invention, and
name of the applicant.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

WASHINGTON, D. C., August 10, 1904.

MAILED " " "

Johann Harmatta,

C/o Marion & Marion,

Montreal, Canada.

Your

Please find below a communication from the EXAMINER in charge of your application.

#183,677, filed Dec. 3, 1903, for Electric Welding.

F. I. Allen ~~XXXXXXXXXXXXXXXXXXXX~~
Commissioner of Patents.

This is in response to the communication filed May 14, 1904.

The claim is rejected on Blevins et al., 758,503, April 26,
1904, Metal heating and working, Welding, Processes.

A. F. Kinnan Ex

W. J. S.

1875

DIV. 37 PAPER NO. 4

MAIL ROOM
NOV 26 1904
U.S. PATENT OFFICE

And't. A.
Claims

J o h a n n H a r m a t t a
c/o M a r i o n & M a r i o n, M o n t r e a l,
C a n a d a .

"Improvements in Processes of Electric Welding".

Ser. No. 183677; filed Dec. 3, 1903.

Hon. Commissioner of Patents,
W a s h i n g t o n D. C.

Sir.-

Erase the claim and substitute the following:

1
Sub. B

1. The process of electrically welding thin metallic sheets and the like, from about two millimeters in thickness downward, consisting in first pressing intimately together the two superposed metallic objects at the very point in which the welding joint is to be formed, and then, whilst maintaining the intimate pressure, heating the objects by passing an electric current through them exactly at said point, in which the welding is to be effected, substantially as set forth.

2. The process of electrically welding thin metallic sheets and the like from about two millimeters in thickness downward, consisting in superposing the metallic sheets and the like, exerting on said thin sheets and the like before and during the welding operation a pressure limited to a material point, and passing for a short moment a current also limited to said material point through said thin sheets and the like, substantially as set forth.

3. The process of forming seams with thin sheets and the like from about two millimeters in thickness downward, consisting in pressing together the parts to be welded in a series of points consecutively, and, whilst maintaining the pressure in said consecutive points, passing an electric current for a short moment exclusively through said points, substantially as set forth.

In sert "from about two millimeters in thickness downward" after "sheets" on page 1, line 6 from above, and on page 4, line 7 from below.

R e m a r k s :

The process described in the U.S. Patent No. 738,903 to B l e v i n s and W i t t a k e r differs essentially from the process forming the object of the present application No. 183,677. In the process of B l e v i n s and W i t t a k e r namely, the inventors intend to weld a great surface, for example

a whole annular surface or a seam, in one stroke.

On the contrary, the applicant desires only to weld the parts together in material points, so that a seam is formed by a series of welded points. Now, in the process of B l e v i n s and w i t t a k e r an enormous amount of current is necessary, so that the latter process is not fit for practical purposes. On the contrary, the process of applicant is very economical and only necessitates a small amount of current, because the heating at the place to be welded is still limited to a material point. Further, in the process of B l e v i n s and W i t t a k e r, owing to the great amount of current used, not only the surfaces to be welded, but also the neighbouring places are heated, so that a great electrical resistance is produced, which increases during the heating, as stated in page 2, line 20 and 21 of the specification. Consequently, B l e v i n s and W i t t a k e r are obliged to use a current regulator (variable resistance or rheostat) in order to be able to gradually increase the current during the welding operation, so that a complicated plant is necessary. Now, in the process of applicant, the use of a current regulator or rheostat is not necessary, because no great change in the electrical resistance takes place during the welding. A change in the strength of current is only necessary when other materials or sheets than before are intended to be welded, but during the welding operation the strength of the current used remains constant.

Furthermore, in the process of B l e v i n s and W i t t a k e r the inventors cannot have taken in consideration that, when thin metallic sheets from about two millimeters in thickness downward are to be welded together, it is absolutely necessary that the surfaces to be welded be in intimate contact, before the electrical current being led in. However, it is quite impossible to press together in one stroke two great surfaces (for example annular surfaces) so perfectly that no small hollow places at all remain, which, as is well known, always give rise to the production of small electrical arcs and consequently to a fusing away or burning through of the thin material at the welding place. Therefore, applicant before the welding operation proper affords a very intimate contact between the superposed objects to be welded, but only in material points, several consecutive points forming a line in the case of seams. Now, as B l e v i n s and W i t t a k e r produce the contact between relatively great surfaces and not only in points, a fusing away or burning through of the thin metallic sheets must always take place, inasmuch as the regulation of the strength of current, that is the fact of letting in a stronger current during the welding, ^{is} of a dangerous or injurious character, that is, often connected with a spoiling or burning through of the thin materials. For welding together thin metallic sheets a quite determined temperature is necessary, which must not

1379

be exceeded, and the heating must only last a short moment, or else the material is fused away or burnt through. In a few words for welding together thin sheets, the heating must be limited to a point and to a very short moment, if really practical results are to be obtained, and the process of applicant is based upon these considerations.

In order to show the favourable results obtained with the new process the applicant is ready to have the process demonstrated and experiments made before the Examiner at the Patent Office in Washington D.C.

An allowance of the new claims or a notice telling if experiments are thought to be necessary is requested.

Very respectfully,

Marion & Marion

Address only
"The Commissioner of Patents,
Washington, D. C."
and not any official by name.

Communications respecting this
application should give the serial number,
date of filing, title of invention, and
name of the applicant.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

WASHINGTON, D. C., March 30, 1905.

MAILED

Johann Hammatta,

C/o Marion & Marion.

New York Life Bldg.,
Montreal, Canada.

your

Please find below a communication from the EXAMINER in charge of ~~the~~ application.

#183,677, filed Dec. 3, 1903, for Electric Welding.

F. I. Allen.

~~XXXXXXXXXXXXXX~~
Commissioner of Patents.

G-5711

This is in response to the amendment filed Nov. 26, 1904.

The claims are rejected on Thomson, 444,928, Jan. 20,
1891, Metal heating and working, Welding, or Thomson, 496,019,
April 25, 1893, Metal heating, Soldering. To make the electrodes
of any desired size is a mere matter of degree and does not involve
invention.

W.J.S.

A. F. Kirman Ex

MAIL ROOM
NOV 17 1908
U.S. PATENT OFFICE

DIV. 37, PAPER NO. 6

Amendt B

Johann Harmatta,
c/o Marion & Marion, Montreal, Canada.
"Improvements in Processes of Electric Welding."
Ser. No. 183677, filed Dec. 3rd, 1903. ROOM 107.

Hon. Commissioner of Patents,

Washington D.C.

Sir:-----

Responsive to the Official action of March 30th, 1908, in the above entitled application, amendment is hereby made as follows.

The applicant does not merely make the electrodes of a suitable size in order to adapt the same to the welding of sheets of very thin material (from about two millimeters in thickness downward), but by his method of welding such sheets of very thin material (from about two millimeters in thickness downward) he solved a problem which until now was considered as quite insoluble.

The U.S. Patent No. 496,019 but relates to an improved method of producing soldered joints. Now, as in the process forming the object of the present invention no solder or uniting metal is used, the process described in the U. S. specification 496019, according to the opinion of applicant, cannot be opposed with right to the invention's object.

Further, the method described in the U. Specification No.444928 quite differs from the process forming the object of the present application. In the method disclosed in said U. S. specification No.444928 there is no question of affording a quite intimate contact between very thin sheets of iron, before the electric current is led to said sheets so as to weld the same together. In said method forming the subject matter of the U. S. patent No.444928 the pressure is only used in order to complete the welding process after the heating of the materials has taken place, but, exactly like in the ordinary welding with the use of a smithy fire, no pressure is exerted upon the sheets or the like at the very first stage of the process. On the contrary, in the process of applicant the pressure is in advance with regard to the welding action of the electric current from the beginning and also during the whole duration of the process.

Furthermore, it is quite certain that never welding trials with very thin sheets of metal - for example of 0.3 mm thickness - have been effected according to the process of the U. S. patent No.444928. If such trials had been made by Thomson before the application of his U. S. Patent some hints as to the absolute necessity of intimately pressing together plates of very thin metal from the beginning before the welding operation proper should have been given in said U.S. specification No.444928, because, if one does not

1882

proceed in this way, a burning through of the thin materials to be welded is unavoidable. It is true that Thomson has provided pressing means, but he does not use said means in the same manner as applicant and besides not for pressing together very thin metal sheets from about two millimeters thickness downward.

The inventor was occupied during quite a number of years with the electric welding and tried to weld together very thin sheets also with the help of the principles stated in the U.S. Patent 444928, but he obtained no practical results. Sometimes only an apparently good welding was obtained, but in the majority of cases the thin materials were burnt through and showed holes like a sieve, said holes being produced by electric sparks generated between the metallic surfaces in imperfect contact, and if a welding of such thin sheets could be obtained at all, the material was very much weakened at the place welded, so that said materials could not be used for practical purpose.

Only after long and repeated experiments the inventor, which during its trials found that a heating of the thin materials before the welding operation proper, that is before the leading in of the electric current, must be avoided under all circumstances, discovered a way or method which permits a welding together of such thin sheets being effected with absolute certainty and reliability i. e. without a failure being possible.

It is quite true that with the devices of Thomson the eventual possibility existed to work in the same manner as applicant, but as a matter of fact nobody has worked in the same way as applicant and no one before applicant was able to weld so very thin metal sheets together with absolute reliability, that is without a burning through or damaging of the very thin metallic sheets being possible.

It is quite remarkable that in all the specifications cited by the United States Patent Office there is only question of the electric welding of object which can also be welded in an ordinary smithy fire, but in said former specifications absolutely nothing is said about the electric welding of very thin sheets of metal which can also not be welded in the fire of a smithy. Therefore the applicant is entitled to believe that no one before him devoted his attention to the welding of thin sheet of metal from about two millimeters in thickness downward, specially on an industrial scale. Consequently, nobody before the applicant was able to discover the fact than in welding very thin metallic sheets, the pressure must still be in advance with regard to the welding.

Besides, please strike the former claims and substitute the following, which are exactly limited with regard to the processes and objects already known:

✓

Sub. C¹

1. The process of electrically welding thin metallic sheets and the like, from about two millimeters in thickness:

1385
downward, which cannot be welded in the fire of a smithy, consisting in first pressing intimately together the two superposed metallic objects at the very point, in which the welding joint is to be formed, and then, whilst maintaining the intimate pressure, heating the objects by passing an electric current through them exactly at said point, in which the welding is to be effected, substantially as set forth.

2. The process of electrically welding thin metallic sheets and the like from about two millimeters in thickness downward, which cannot be welded in the fire of a smithy, consisting in superposing the metallic sheets and the like, exerting on said thin sheets and the like before and during the welding operation a pressure limited to a material point, and passing for a short moment a current also limited to said material point through said thin sheets and the like, substantially as set forth.

3. The process of forming seams with thin sheets and the like from about two millimeters in thickness downward, which cannot be welded in the fire of a smithy, consisting in pressing together the parts to be welded in a series of points consecutively, and, whilst maintaining the pressure in said consecutive points, passing an electric current for a short moment exclusively through said points, so as to keep the pressing action in advance of the electric heating during the whole welding operation, substantially as set forth.

1386

Favourable reconsideration and an early allowance is requested.

Very respectfully

Marion & Marion
Attorneys for applicant.

Montreal, CANADA,

November 15th, 1905.

S.

M./P.

Alfred J. ...
The Commissioner of Patents,
Washington, D. C.
and not by official name.

J

If communications respecting this
application should give the serial number,
date of filing, title of invention, and
name of the applicant.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

WASHINGTON, D. C., December 1, 1905.

MAILED

Johann Karmatta,

C/o Marion & Marion,

N.Y. Life Bldg.,
Montreal, Canada.

your

Please find below a communication from the EXAMINER in charge of ~~the~~ application of,

#183,677, for Electric Welding, filed Dec. 3, 1903.

F. I. Allen

XXXXXXXXXXXXXXXXXXXX
Commissioner of Patents.

This is in response to the amendment filed Nov. 17, 1905.

Figures 1 and 2, which are for the purpose of illustrating what is old in the art, should be canceled and the description accordingly revised, - *ex parte* Wadsworth, 92 O.C., 1898. The description should be confined to applicant's process of welding, and not to a discussion of prior processes and their disadvantages.

The last paragraph on page 2, page 3, and the first two paragraphs on page 4, should all be canceled.

The expression "from about two millimeters in thickness downward", introduced by amendment in the description and claims, should be canceled as it involves a departure from the original disclosure.

In the claims the expression "which cannot be welded in the fire of a smithy" should be canceled as it is in the form of a negative limitation; further, it defines no property of the material definitely.

In regard to claim 3, the word "exclusively" involves new matter and is also inaccurate. The subject matter of this claim has not been shown or described.

The claims are all rejected on the patents to Thomson, of record. These patents clearly disclose applicant's process

of welding. As described in patent 444,928, the plates to be welded are pressed together by means of the screw S, thus forming an electrical contact between them, the electric current is then turned on for the purpose of heating the plates and forming a weld between them, - see the description in lines 84 to 94, page 1 of said patent.

Rule.

A. P. Kinnan Ex

1389

Serial No. 183677 Paper No. 8.
Revocation of Power of Att'y.
Filed Mar. 23, 1906

Revocation of Power of Attorney.

To the Commissioner of Patents:

The undersigned having, on December 3rd 1903
appointed Mr. M a r i o n of M o n t r e a l

his attorney to prosecute an application for letters patent, which application was filed on December 3rd 1903 for an improvement in "Electric Welding" (serial number 183677), hereby revokes the power of attorney then given.

Signed at , in the county of
and State of , this day of 19

Johann Harmatta

1399

Serial No. 183,677 Paper No. 9

Power of Attorney.

Filed Mar. 23, 1906.

Power of Attorney.

To the Commissioner of Patents:

The undersigned having, on December 3rd 1903 made application for letters patent for an improvement in "Electric Welding" (serial number 183677), hereby appoints
A. C. Hugh Duffy (O. E. Duffy & Son)
Mr. O. E. Duffy of Washington, D.C.

in the County of and State of , his
attorneys with full power of substitution and revocation,
to prosecute said application, to make alterations and
amendments therein, to receive the patent, and to transact
all business in the Patent Office connected therewith.

Signed at , in the county of, State
of , this day of , 11

Johann Harmatta

ADDRESS ONLY
THE COMMISSIONER OF PATENTS
WASHINGTON, D. C.

Serial No. 183677 1 per No. 9
2-669

E.E.C. DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C.

March 26, 1906

You are hereby informed that YOUR POWER OF ATTORNEY HAS BEEN
REVOKED ~~XXXXXXXX~~ in the matter of the application of Johann Harmatta

for Letters Patent for an IMPROVEMENT IN Electric Welding

No. 183,677 Filed December 3, 1903

Very respectfully,

F. I. Allen

~~XXXXXXXXXXXXXXXXXXXX~~

Commissioner.

Marion & Marion,
N. Y. Life Bldg.,
Montreal, Can.

1392

ADDRESS ONLY
THE COMMISSIONER OF PATENTS
WASHINGTON, D. C.

2-000

E.E.C.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C.

March 26,

1906

You are hereby informed that YOUR POWER OF ATTORNEY HAS BEEN
~~RECEIVED~~ ACCEPTED in the matter of the application of Johann Marmatta

for Letters Patent for an IMPROVEMENT IN Electric Welding

No. 183,677 Filed December 3, 1903

Very respectfully.

F. I. Allen.

~~XXXXXXXXXXXXXXXXXXXX~~

Commissioner.

O. E. Duffy & Son,

612 F St. N.W.,

Washington, D. C.

1393

O. E. DUFFY & SON,
PATENTS
612 F Street, N.W.
WASHINGTON, D. C.

DIVISION 37, Paper No. 11

MAY 18 1906

C

U. S. PATENT OFFICE.

A M E N D M E N T .

Room 107.

Johann Harmatta.

Electric Welding.

Filed Dec. 3, 1903.

Ser. No. 183,677.

Hon. Com. of Patents.

Sir:-

Please amend the above named application as follows :

Replying to Official letter of December 1, 1905,
amendment is made as follows:

✓
Cancel Figures 1 and 2.

✓
Cancel first 5 lines of page 2 of specification.

✓
In lines 6, 8 and 10, page 2 change the numerals
"3", "4" and "5" to 1, 2 and 3 respectively.

✓
In line 12, page 2 change "As Fig. 1 shows" to
In known processes.

✓
Same line cancel "a b".

✓ In line 13, page 2 cancel "1.2"

In line 17 page 2 cancel "3".

In line 20, page 2 cancel "3".

In line 31, page 2 cancel "as is shown in Fig. 1".

In last line page 2 cancel "at 4".

Cancel second and third paragraphs of page 3.

In line 4, page 4 change "5, 6 (Figs. 4 and 5)" to
Figs. 2 and 3.

In line 7, page 4 change "4 and 5" to 2 and 3.

In line 22, page 4 change "3" to 1.

In line 3 from bottom of page 4 change "4 and 5"
to 2 and 3.

Johann Harmatta.

1335
\$183,677.

✓ Cancel the claims and substitute:

Canceled
per D

C¹

1: The process of electrically welding thin metallic sheets and the like consisting in applying suitable electrodes on the metallic objects at the very point at which the welding joint is to be formed, then causing said electrodes to exert a pressure on the metallic objects sufficiently to press the metallic objects intimately together at the point at which the welding joint is to be formed, then heating the metallic objects by passing an electric current through said electrodes and through the metallic objects, maintaining the pressure of said electrodes on the metallic objects during the passage of the electric current through the electrodes and metallic objects.

R E M A R K S.

The numerals of the Figures on the drawings will be changed to agree with the specification.

Very respectfully,

O. E. Duffy & Son

Attys. for Applicant.

1896

37 Room 107

2-260

P

Form No. 12

Address only
The Commissioner of Patents,
Washington, D. C.,
and not any official by name.

A communication respecting this
application should be so directed to the
date of filing, with or without, and
name of the applicant.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

WASHINGTON, D. C., June 7, 1906.

MAILED " " "

Johann Harmatta,

C/o O.E. Duffy & Son,

Washington, D.C.

your

Please find below a communication from the EXAMINER in charge of ~~the~~ application of
#183,677, filed Dec. 3, 1903, for Electric Welding.

F. I. Allen

~~XXXXXXXXXXXXXX~~
Commissioner of Patents.

This is in response to the amendment filed May 18, 1906.

The changes directed to the description as given in the second page of the amendment filed May 18, 1906, have not been entered as the proper places for the changes indicated are not found in the description.

The requirements noted in lines 4 to 12, of Office letter Dec. 1, 1905, are repeated. The figure numbers of the remaining figures should be corrected.

In claim 1st and the like^s is objected to as alternative and indefinite. See ex parte Caldwell & Barr 120 O.G. 2525.

The word "objects" throughout the claims should be changed to -sheets- to correspond with line 2. The claim is rejected on Thomson, 496,019, or Thomson, 444,928, both of record.

J.F.R.

A. F. Kinnan Ex.

DIVISION 37, Paper No.

PAPER NO. 13

AMENDMENT. D DEC 3 1906

U.S.PATENT OFFICE.

Room 107.

J o h a n n H a r m a t t a .

" E l e c t r i c W e l d i n g . "

c/o O. E. D u f f y & S o n .

Filed: Dec. 3, 1903.

Ser.No.183677.

PATENT OFFICE,
DEC 3 1906
DIV. 18, FILED.

Hon. Commissioner of Patents,

Sir :

Replying to Official Letter of June 7th, 1906,
amendment is made by substituting the enclosed descrip-
tion and claim to the former ones.
Cancel Figures 1 and 2 on the drawing.

R e m a r k s .

In accordance with the requirements of the Official Letter of December 1st 1906 the actual description is confined to applicant's process of welding and all parts of the former description objected to in said Official Letter have been canceled.

In the claim the words "and the like" and the words "Objects" have been changed throughout to -
sheets-.

It is thought that the object of the claim is patentable, as the same relates to a series or combination
1.

1338
of single steps not disclosed in the patents to
T h o m s o n 496019 and 444928. In the patent to
Thomson there is no question of the exerting of a
quite intimate pressure at the very point in which the
welding joint is to be formed, this being absolutely
necessary for example when thin metallic sheets are to be
welded together in a series of points consecutively.

Favourable reconsideration and early allowance
is requested for.

Very respectfully,

O. E. Duffy & Son

The subject of my invention is a process of welding thin metallic sheets by means of electricity.

As is well known, great difficulties have hitherto been experienced in electrically welding thin metallic sheets and even such a welding was quite generally considered as being impracticable. The thin metallic sheets were still damaged and even burnt through, because sparking could never be avoided. Now, by my improved process I completely overcome the mentioned difficulties.

My process consists in applying suitable electrodes on the metallic sheets at the very point at which the welding joint is to be formed, then causing said electrodes to exert a pressure on the metallic sheets sufficiently to press the metallic sheets intimately together at the point at which the welding joint is to be formed, then heating the metallic sheets by passing an electric current through said electrodes and through the metallic sheets, and finally maintaining the pressure of said electrodes on the metallic sheets during the passage of the electric current through the electrodes and metallic sheets.

For the purpose of enabling my invention to be

more readily understood, I will make reference to the accompanying drawing, in which

Fig. 1 is a section of portions of two thin sheets with an air-gap between them.

Fig. 2 is a sectional view illustrating the employment of my new process in welding thin metallic sheets.

Fig. 3 is a like view showing the welding of the overlapping ends of two pieces of sheet metal.

Supposing that thin metallic sheets 5 and 6 (Fig. 1) intended to be welded together by means of electrodes arranged opposite each other loosely lie upon each other or are not subjected to a rational pressure, they still assume at some points air gaps between them, as represented in Fig. 1 in a somewhat exaggerated manner for the sake of easier understanding. If now the electric current is completed through the two electrodes and the sheets, an arc or a line of sparks will be formed as a consequence of the air gap existing between the two thin metallic sheets. However, under the above circumstances, the arc or line of sparks still exerts an injurious action by producing a fusing of the thin metallic sheets to a certain depth or even a complete perforating or burning through of the same.

essential
Now, the advantage obtained with my improved process is that in welding thin metallic sheets the formation of an arc or spark, which proves disastrous, is wholly avoided, whereby a perfectly sound welded joint be-

tween two thin metallic sheets, or between a thin metallic sheet and a thicker object, is attained.

For the purpose of preventing the formation of the injurious arc, I submit the superposed thin metallic sheets to be welded (Fig. 2 and 3) to a quite intimate pressure at the very point at which the welding joint is to be formed, the amount of said pressure depending upon the nature of the said sheets. This pressure I effect by means of the electrodes a b (Fig. 2 and 3) themselves, or with the aid of other suitable means. The purpose of this intimate pressure is to expel as far as possible the layer of air between the two thin metallic sheets. In this manner the two parts to be welded are, as it were, mechanically connected to form a single homogenous body. This is of great importance when two very thin sheets are to be welded together, for, as is well known, thin sheets have always a more or less wavy form, as far as they have not been straightened in the process of manufacture so as to present a surface which is practically quite flat, such as is the case with thick sheets. Such thin sheets therefore, unless submitted to a heavy mechanical pressure never lie close upon ^{one} another; on the contrary, in consequence of the waved form, air gaps are left between them, so that if a current were led through them, it would aid sparking and the formation of arcs.

After the two metal objects have, therefore, been prepared in this way, that is to say, by the application

of a rational mechanical pressure caused to lie quite closely upon each other, without any air-gap between them, the electric circuit is closed, the mechanical pressure being still maintained.

At the place where the electrodes a b exert pressure therefore (Figs. 2 and 3), that is to say, where the current is able to flow through the bodies to be welded without having to pass through a layer of air and form sparks, the metal is heated to welding heat. Immediately this temperature is reached, the continuous pressure effects the desired union, that is to say, welding of the two thin metallic sheets 5 and 6, without injury by perforation or burning, in the manner explained, having taken place, even if the sheets are extremely thin. It should be remarked that the pressure to be exercised on the bodies before and during welding, must be selected according to the thickness of the sheets, and can be adapted to suit the condition of the bodies for the time being. Thicker sheets or objects do not require so much pressure as thin ones because, as already explained, they have a more even, uniform shape and therefore when laid upon each other can be readily closed together, that is to say pressed so that no injurious air gap is formed.

Since the essential condition is, that the two metal objects to be united are firmly pressed together before welding at the very point at which the welding joint is to be formed, it is obvious that with this process not only two equally thin sheets, but a very thin sheet and

1-1011
a thicker metal object may be welded without danger of the former being burnt through.

Naturally the required superficial pressure may be exerted by only one electrode, or by both the electrodes.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is :

Sub. E-
The process of electrically welding thin metallic sheets, consisting in applying suitable electrodes on the metallic sheets at the very point at which the welding joint is to be formed, then causing said electrodes to exert a pressure on the metallic sheets sufficiently to press the metallic sheets intimately together at the point at which the welding joint is to be formed, then heating the metallic sheets by passing an electric current through said electrodes and through the metallic sheets, and maintaining the pressure of said electrodes on the metallic sheets during the passage of the electric current through the electrodes and metallic sheets.

Div. XVI, Room 19

C.E.H.

2-200

Above only
 "The Commissioner of Patents,
 Washington, D. C."
 and not any official by name.

Paper No. 14.
 If communication respecting this
 application should give the serial number,
 date of filing, title of invention, and
 name of the applicant.

DEPARTMENT OF THE INTERIOR
 UNITED STATES PATENT OFFICE

WASHINGTON, D. C., December 15, 1906.

MAILED " " "

Johann Harmatta,C. O. E. Duffy & Son,612 F. Street, N. W.,Washington, D. C.

your

Please find below a communication from the EXAMINER in charge of ~~your~~ application of,

#183,677, filed December 3, 1903, for Electric Welding.

F. I. Allen

~~XXXXXXXXXXXXXXXXXXXX~~
Commissioner of Patents

This action is in response to amendment of December
 3, 1906.

The claim is rejected on both Thompson, 496,019, and
 Thompson, 444,928, both of record, and also on Blevins, 758,503,
 of record, attention being directed to lines 29 to 31 of page 1
 of this patent and also to lines 5-6 of the claim thereof.

Campbell
 Examiner, Division XVI.

F.T.W.

APPLICATION ROOM
DEC 4 1907
U.S. PATENT OFFICE

1495
PAPER NO. 15
AMENDMENT. 2

Room 109.

J o h a n n H a r m a t t a,

"Electric Welding"

c/o O. E. D u f f y & Son,

Filed Dec. 3, 1903.

Ser. No. 183677.

PATENT OFFICE,
DEC 5 1907
DIV. 16, FILED.

Hon. Commissioner of Patents

Sir:

Replying to Official Letter of Dec. 15th, 1906
amendment is made by substituting the following 2 claims
to the former one;

Erased
Per G

E¹

F

1.) The process of electrically welding a plu-
rality of metal sheets, consisting in exerting a heavy
mechanical pressure by means of electrodes on said
sheets, thereby flattening, smoothing out and eliminating
all irregularities and intimately pressing said sheets
together, whereby air space and interstices between said
sheets are eliminated, subsequently passing an electric
current ^{through} ~~through~~ the sheets thus softening and welding same
while maintaining the heavy pressure of the electrodes
on the sheets.

2.) The process of electrically welding thin
metallic sheets, consisting in applying suitable elec-
trodes on the metallic sheets at the very point at which
the welding joint is to be formed, then causing said
electrodes to exert a maximum pressure on the metallic

sheets sufficiently to press the metallic sheets intimately together at the point at which the welding joint is to be formed, then heating the metallic sheets by passing an electric current through said electrodes and through the metallic sheets, and maintaining the maximum pressure of said electrodes on the metallic sheets during the passage of the electric current through the electrodes and metallic sheets.

R e m a r k s .

It is a matter of fact that very great difficulties have formerly been experienced in electrically welding together very thin metallic sheets. Even the welding together of such thin metallic sheets was considered as quite impossible before the applicant obtained a full success in that direction.

The tenor and gist of applicants invention, as clearly stated in the specification forming a part of this specification consists in welding thin sheets of metal such as used in kitchen ware by pressing said sheet together between electrodes with very great or maximum pressure, this pressure being so great that all irregularities and unevenness will be pressed smooth and flattened out of the sheets, and that all air spaces and interstices between the sheets will be eliminated. Then a current is passed in a known manner between the electrodes, whereby the metal is softened and welding takes place, as said very great pressure is maintained.

The new process composed of a certain number of definite steps is clearly specified in the 2 claims filed to-day, and in view of the fact that an effect

1407

which before the present application was considered as
impossible or inadmissible is obtained, the process for-
ming the object of the present application ^{is} thought to
be patentable.

Favourable reconsideration of the case is
requested for.

Very respectfully,

O. E. Duffy & Son

1408

Div. 16 Room 109

2-260

Paper No. 16

Address only
 "The Commissioner of Patents,
 Washington, D. C."

FJR

All communications respecting this
 application should give the serial number,
 date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR
 UNITED STATES PATENT OFFICE

WASHINGTON, D. C., Jan. 6, 1908.

MAILED " " "

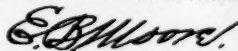
Johann Hermatta,

C/o O. E. Duffy & Son,

612 F St., N. W., Washington, D. C.

Your:

Please find below a communication from the EXAMINER in charge of ~~the~~ application of,
 for Electric Wekdung, filed Dec? 3, 1903, Ser. No. 183,677.



Commissioner of Patents

In response to amendment of Dec. 4, 1907:

The views of the drawing need to be renumbered to read
 1, 2 and 3.

In claim 1, line 8, "trough" should be through.

Both claims are rejected on the references of record.
 Thomson 496,019, discloses the use of any desired pressure
 exerted by the electrodes before, during and after the passage of
 the welding current.

Backus

Wm A Kinnan

Examiner, Div. 16.

APPLICATION ROOM
JAN 6 1909
U.S.PATENT OFFICE

Serial No. 183,677 Paper No. 17

"P".

Room 109

U.S.PATENT OFFICE,
JAN 7 1909
DIVISION 26

J o h a n n H a r m a t t a ,

c/o O.E. D u f f y & S o n ,

" E l e c t r i c W e l d i n g " ,

Filed Dec. 3, 1903.

Ser. No. 183677.

Hon. Commissioner of Patents,

S i r :-

Replying to Official Letter of January 6th, 1908,
I beg to state the following :

Kindly have at my costs the drawings altered
by the Chief Draughtsman, so that the drawings read 1, 2
and 5;

In claim 1, line 8, substitute through ~~as~~ for
"trough";

As in the Official Letter only the Patent
No.496019 to T h o m s o n is referred to it is
thought that the former references cited by the Patent
Office are now overcome.

Now, the U.S.Patent No.496019 cited in the Offi-
cial Letter relates only to a soldering method and not to
a welding method as in the present application. Therefore
the U.S. patent No.496019 according to the belief of
applicant cannot be considered as an anticipation of the
object of the invention applied for.

The conditions of working and results to be ob-
tained are quite different in both cases and the process
of applicant is to be considered as a very useful im-

provement in welding processes in view of the prior state of the art.

On account of the above statements favourable reconsideration and early allowance is requested for.

Respectfully

O. E. Duffy & Son

Address only
The Commissioner of Patents,
Washington, D. C.

Communications respecting this
application should give the serial number,
date of filing, and title of invention.

PH

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

WASHINGTON, D. C., February 9, 1909.

MAILED " " "

Johann Harmatta,

Care, O. E. Duffy & Son,

612 F Street, N. W., Washington, D. C.

Please find below a communication from the *EXAMINER* in charge of *your* application *of*,
for Electric Welding, filed Dec. 3, 1903, Serial No. 183,677.

E. B. Moore

Commissioner of Patents.

In response to amendment of January 6, 1909.

The term "rational pressure" used in line 12, page 2, and in
line 1, page 4, is not understood.

The specification now in the case contains matter for which
there is no warrant in the original specification. For example,
Fig. 1 and the matter relating thereto involve a departure from
the original disclosure. This figure and the matter relating
thereto must be canceled, and the specification revised in such
a manner as to restrict it to matter illustrated or described
in the original disclosure.

Claim 1 is rejected as unwarranted by the original disclosure.

In lines 4 and 7 of claim 2, should not "welding" be changed
to welded?

Claim 2 is rejected as presenting nothing patentable over
Thomson, 444,928, or 496,016, or Elevins, 758,503, all of record.

It is thought that if there is any patentable matter in this
case it resides in the securing of the sheet metal parts together
by means of the small round, sharply defined place of welding
which answers the purpose of a rivet, as is set forth on page 6 of
the original specification.

H L

A. P. Shaw Exr

1412
APPLICATION ROOM
JAN 27 1910
U.S. PATENT OFFICE

Paper No. 19
Amend't. "G"

U.S. PATENT OFFICE,
JAN 28 1910
DIVISION 26

Room 105

Johann Harmatta

c/o O. E. Duffy & Son

"Electric Welding"

Filed: Dec. 3, 1903,

Ser. No. 183677.-

Hon. Commissioner of Patents,

Sir:-

Replying to Official Letter of February 9th, 1909
amendment is made by substituting the enclosed descrip-
tion, claims and drawing to the former ones.

"G"

Remarks:

The present description, claims and drawing are li-
mited to the subject-matter which in the last Official
Letter is deemed patentable by the U. S. Patent Office.
Great care has been taken not to describe anything which
was not illustrated or explained in the original disclo-
sure.

For the matter which is considered by the U. S.
Patent Office as involving a departure from the original
disclosure it is intended to file in the next time a di-
visional application.

It is thought that the two claims submitted at
present are allowable. The 1st claim is more specially
directed upon the new process or method of uniting the
sheet metal parts together. The 2nd claim relates to the

several steps of said process or method.

As applicant strictly complied with the official requirements favourable reconsideration and early allowance is requested for.

V e r y R e s p e c t f u l l y ,

O. E. Duffy & Son

R. H. V.

Enclosures:

1 new description

with claims,

1 new drawing.

--G¹--Sub K¹

The subject of my invention is a process or method of welding thin metallic sheets at particular places or spots by means of electricity, said process being intended for the manufacture of metal articles of all kinds, especially those of the thinnest sheet metal, such as kitchen-hardware, household vessels or the like, by direct electric welding.

My new process or method of electrically welding thin metallic sheets essentially consists in securing the sheet metal parts together by means of a small round, defined place of welding which perfectly answers the purpose of a rivet.

I preferably carry out my process by means of the following steps consisting in introducing the sheet metal parts to be welded between electrodes having the form of pins, pressing said electrodes firmly together centrally i.e. at the very place at which the welding is to be effected and closing the circuit, whereby the said small round, very sharply defined place of welding is obtained.

For carrying out the new process various apparatus may be employed, as the necessary pressure may be exerted at the place of welding by the aid of any of these tech-

nical means which are suitable for producing or transmitting pressure, for example with a press either direct or by means of indirect transmission by levers. Or it may be by means of simple hand levers, that is to say, by means of direct or indirect manual power,

In the accompanying drawing.

Fig. 1 is a view illustrating the welding effected according to my new process of two thin metallic sheets of equal thickness, intermittently or at certain spots only.

Fig. 2 is a side elevation of a welding device (also illustrated in part in Fig. 1) according to which the pressure is exercised by pin shaped electrodes, the form of which may be suited to the particular purpose in view, and which may be adapted to work on the smallest possible surface of contact.

Figs. 3 and 4 show two forms which may be adopted for the ends of the contacting electrodes.

In order to effect the welding only at particular places or certain spots, the sheet metal or other bodies, the edges of which lie upon each other, are introduced between the two electrodes a b, as represented in Fig. 1 which as an example shows the welding of two metal sheets. Of the latter the one during the welding operation is pressed firmly upon the other in the direction of the arrow.

For said welding operation the apparatus provided with pin-shaped electrodes a b shown in Fig. 2 may be advantageously employed. The lower electrode b is inserted

-61--

in the conductor g, whilst the upper electrode a is carried by an arm d and by means of a hand-lever e carried by said arm d can be turned on the shaft f in such manner that the points of the electrodes a b approach or recede from each other. If then two superposed sheet metal ends to be welded together are introduced between the electrodes, and the latter then firmly pressed together and the circuit closed, a small round, very sharply defined place of welding is caused which, as already stated above, perfectly answers the purposes of a rivet. In this event, also, especially in the case of thin vessels which are not required to withstand great pressure, the pressure on the place of welding may at the right moment be exactly regulated or kept within the proper limits.

In Figs 3 and 4 the electrodes a¹ b¹ and a² b² respectively are given special shapes which answer to particular purposes.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is :-

Erased
Per H

1. The process of electrically welding thin metallic sheets, consisting in securing the sheet metal parts together by means of a small round, defined place of welding which answers the purpose of a rivet.

per K
Per-H-

1. The process of electrically welding thin metallic sheets, which consists in introducing the sheet metal parts to be welded between electrodes having the

Per H ~~form-of-pine, pressing said electrodes firmly together~~
and closing the circuit, whereby the specified small
round, very sharply defined place of welding which
answers the purpose of a rivet is obtained, substantially
as set forth.

Add H¹

VCC

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

(Copy mailed applicant.) WASHINGTON, D. C., March 22, 1910.

MAILED * * *

Johann Harnatta,
c/o C. E. Duffy & Son,
Washington, D. C.

your
Please find below a communication from the EXAMINER in charge of the application of,
for Electric Welding, filed Dec. 3, 1903, Serial No. 183,677.

E. B. Moore

Commissioner of Patents

In response to amendment of Jan. 27, 1910.

Claim 1 should state the steps necessary to produce the weld.

Claim 2 is objectionable for the reason that it includes in a process claim the specific shape of the apparatus used to perform the process.

Claim 1 is rejected on Bernados et al., 363,320, May 17, 1887, (219-15).

Except as noted claim 2 appears to be allowable.

Claims 1, 5, 6, 16, 17, 18, 19 and 20 of the patent to Rietzel, 928,791, July 30, 1909, (219-10) are suggested to applicant in accordance with the provisions of Rule 96 for the purposes of interference. He is required to make these claims on or before May 3, 1910, otherwise he will be considered to have disclaimed the subject matter thereof in accordance with Rule 96 and the claims now in the case will be rejected as covering nothing patentable over such disclaimer.

Van Nest

A. P. Shaw Exr

183,677

APPLICATION ROOM
MAR 30 1910
U.S. PATENT OFFICE

Paper No. 21

"H"

U.S. PATENT OFFICE
MAR 31 1910
DIVISION 26

A M E N D M E N T .

Room 105.

Johann Harmatta.

Electric Welding.

Filed Dec. 3, 1903.

Ser. No. 183,677.

Hon. Com. of Patents.

Sir:-

Please amend the above named application as follows:

✓ Cancel claim 1.

✓ Change numeral of claim "2" to 1 and add the following
claims:

2: The hereinbefore described improved method of fastening two pieces of metal together by electrically welding them to one another at spots only of their juxtaposed or opposite faces by the application of pressure and heating current localized in such spots.

3: The method of uniting two sheet metal pieces together face to face, consisting in pressing them together, and simultaneously with the pressure, passing an electric current from one to the other at isolated or distinct spots in the areas lapping or opposed, said spots being separated from one another by such a distance that there is a union of the sheets at spots entirely surrounded by areas of no union.

4: The method of uniting sheets of metal by pressing them together and at the same time passing a heating and welding current from one to the other at a spot on their meeting surfaces which is restricted in area throughout the operation so as to leave on the meeting surfaces a well-defined and comparatively extensive area of no union completely surrounding said spot.

H¹

5: Metal plates fastened together by a number of distinct or isolated welds on their meeting surfaces and in spots comprising meeting portions of the metal plates, the backs of said plates being practically unaltered in their metallic condition and the spots on the meeting surfaces being separated from one another by distinct unwelded areas.

6: Sheet metal work comprising pieces of sheet metal welded together in the material of their meeting surfaces and in spots only, each surrounded by distinct areas of unwelded union, the back surfaces of said pieces being substantially unaltered over the welded spots, substantially as and for the purpose described.

7: Composite metal work having its component pieces welded together in spots only involving the material of their opposed or meeting surfaces, said spots being each entirely surrounded by distinct areas of unwelded union and the portion of the pieces back of the welds being substantially unaltered, as and for the purpose described.

8: Metal work comprising a metal plate fastened on its surface to the opposed surface of another piece of metal by a weld at a spot only in the material of the opposed surfaces, said spot being surrounded by a distinct area of unwelded union and the back surface of said plate being practically unaltered over said spot, as and for the purpose described.

9: A metal article comprising two bodies of metal having adjacent plane surfaces united at a plurality of spaces and isolated spots of integral and autogenous welded union, the metal at the spots of welded union having substantially the same qualities as at other points.

10: 13 The process of electrically welding thin metallic sheets consisting in securing together directly overlapping metallic sheets by means of a small defined place of welding which answers the purpose of a rivet.

11: 14 The process of electrically welding thin metallic sheets consisting in overlapping the metal sheet parts to be welded and securing said parts together by means of small defined places of welding only at points.

12: 15 The process of electrically welding thin metallic sheets, which consists in directly overlapping the metallic sheets to be welded, introducing said overlapping metal sheet parts between pin-shaped electrodes, and passing through the electric current, whereby the metal parts at the place of welding become secured at a sharply defined place.

Johann Harmatta.

Ser. No. 183,97

In claim 2, lines 3 and 4 cancel "having the form of pine".

REMARKS.

The claims in the patent to Rietsel, #928,701 designated by the Examiner have been inserted into the case as requested.

Respectfully,

O. E. Duffy & Son

Attys. for Applicant.

Div. 25 Room 105

M-200

Paper No. 22

The Commissioner of Patents,
Washington, D. C.

All communications respecting this
application should give the serial number,
date of filing, and title of invention.

VCC

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

WASHINGTON, D. C., April 11, 1910.

MAILED " " "

Johann Harmatta,

c/o O. E. Duffy & Son,

Washington, D. C.

your

Please find below a communication from the EXAMINER in charge of ~~the~~ application of,
for Electric Welding, filed Dec. 3, 1903, Serial No. 183,677.

E. B. Moore

Commissioner of Patents

In response to amendment of Mar. 30, 1910.

Claims 11, 12 and 13 are each rejected on *Benardos et al.*, of
record.

Claims 1 to 9, inclusive, may be allowed.

The interference heretofore referred to will not be postponed
pending reply to this rejection but will be declared at once.
Further action by applicant, responsive to the rejection of claims
11, 12 and 13, may be postponed until the termination of the inter-
ference.

Van Nest

A. P. Shaw Exr

INTERFERENCE.

Interference No. 31792

Paper No. 23

Name, Johann Harmatta

Serial No. 183,677

Title, Electric Welding

Filed, Dec. 3, 1903

Interference with Adolph F. Rietzel.

DECISIONS OF

Primary Examiner, Dated,

Ex'r of Interferences, Favorable Dated, Aug. 7/12.

Board, Dated,

Commissioner, Dated,

REMARKS:

This should be placed in each application or patent involved in interference in addition to the interference action by Primary Examiner.

Apr. 14, 1910.

DEPARTMENT OF THE INTERIOR,

UNITED STATES PATENT OFFICE,

(Copy mailed applicant.) WASHINGTON, D. C.,

Johann Harmatta,

c/o O. E. Duffy & Son,

Washington, D. C.

190
U.S. PATENT OFFICE,
INTERFERENCE DIVISION
APR 26 1910
MAILED.

Please find below a copy of a communication from the Examiner concerning your application for "Electric Welding", filed December 3, 1903, Serial No. 183,677.

Very respectfully,

Route No. 105.

All communications should be addressed to:
The Commissioner of Patents,
Washington, D. C.

31792

E. B. Moore.
Commissioner of Patents.

Your case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before the 27 day of JUN 1910, 190, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

INVENTION.

1. The hereinbefore described improved method of fastening two pieces of metal together by electrically welding them to one another at spots only of their juxtaposed or opposite faces by the application of pressure and heating current localised in such spots.

2. The method of uniting two sheet metal pieces together face to face, consisting in pressing them together, and, simultaneously with the pressure, passing an electric current from one to the other at isolated or distinct spots in the areas lapping or opposed, said spots being separated from one another by such a distance that there is a union of the sheets at spots entirely surrounded by areas of no union.

3. The method of uniting sheets of metal by pressing them together and at the same time passing a heating and welding current from one to the other at a spot on their meeting surfaces which is restricted in area throughout the operation so as to leave on the meeting surfaces a well-defined and comparatively extensive area of no union completely surrounding said spot.

4. Metal plates fastened together by a number of distinct or isolated welds on their meeting surfaces and in spots comprising meeting portions of the metal plates, the backs of said plates being practically unaltered in their metallic condition and the spots on the meeting surfaces being separated from one another by distinct unwelded areas.

5. Sheet metal work comprising pieces of sheet metal welded together in the material of their meeting surfaces and in spots only

1
4
2
5

each surrounded by distinct areas of unwelded union, the back surfaces of said pieces being substantially unaltered over the welded spots, substantially as and for the purpose described.

6. Composite metal work having its component pieces welded together in spots only involving the material of their opposed or meeting surfaces, said spots being each entirely surrounded by distinct areas of unwelded union and the portion of the pieces back of the welds being substantially unaltered, as and for the purpose described.

7. Metal work comprising a metal plate fastened on its surface to the opposed surface of another piece of metal by a weld at a spot only in the material of the opposed surfaces, said spot being surrounded by a distinct area of unwelded union and the back surface of said plate being practically unaltered over said spot, as and for the purpose described.

8. A metal article comprising two bodies of metal having adjacent plane surfaces united at a plurality of spaced and isolated spots of integral and autogenous welded union, the metal at the spots of welded union having substantially the same qualities as at other points.

The interference involves your application above identified, and

An application (Patent No. 928,701, Pat'd July 20, 1909) for "Uniting the Component Parts of Composite Sheet Metal Structures", filed by Adolph F. Rietzel, whose post office address is Lynn, Mass., whose attorneys are Townsend & Decker of 141 Broadway, New York City, and whose assignee is the Thomson Electric Welding Company, of Lynn, Mass, a corporation of Maine.

The relation of the counts of the interference to the claims of the respective parties is as follows:

<u>Counts:</u>	<u>Rietzel:</u>	<u>Harmatta:</u>
1	1	2
2	5	3
3	6	4
4	16	5
5	17	6
6	18	7
7	19	8
8	20	9

If the interference is decided against Harmatta all the claims now in the case will be rejected as not patentable over the issue.

Van Nest

A. P. Shaw Exr

1437
U.S. PATENT OFFICE,
JAN 7 1911
DIV. 3.

AM E N D M E N T .

Serial No. 183677
Paper No. 25
Amendment. I

Room 107.

Johann Harmatta.

Electric Welding.

Ser. No. 183,677.

Filed Dec. 3, 1903.

Hon. Com. of Patents.

Sir:-

Please amend the above named application as follows:

✓ Insert the following claims 10, 11 and 12.

er J 10: The herein described method of uniting two separate
pieces of metal at a number of distinct or separate spots
separated from one another by well defined areas of no union,
I¹ consisting in applying pressure localized at the spots of desired
union, and passing electric current through the pieces from one
to the other while confining the flow of current to said spots
until the union is effected.

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11: The herein described method of uniting two pieces of
metal consisting in pressing them together while passing a
heating electric current from one to the other and localizing the
flow of current and the heating throughout the operation in a
spot or spots of circumscribed or limited area as compared with
per J the area of the immediately opposed surfaces so as to limit the
union of the pieces to the spot or spots.

12. The improved method of uniting two pieces of metal
at a spot or spots only in their opposed meeting surfaces
consisting in pressing the two pieces together and passing a
welding electric current from one to the other while localizing
the pressure in and confining the flow of current to the spot

1-438
Johann Harmatta.

Ser. No. 183,677.

so as to produce an isolated spot or spots of union
per J or spots of desired union leaving distinct or well defined
areas in which the pieces are not welded together.

Respectfully,

O. E. Duffy & Son

Attys. for Applicant.

APPLICATION ROOM
JUN 8 1911
U.S. PATENT OFFICE

U.S. PATENT OFFICE,
JAN 8 1911
DIV. 3.

Serial No. 183677
Paper No. 26 -
Amendment. J.

A M E N D M E N T .

Room 107.

Johann Harmatta.

Electric Welding.

Filed Dec. 3, 1903.

Ser. No. 183,677.

Hon. Com. of Patents.

Sir:-

Please amend the above named application as follows:

In reading over the claims submitted in the last
amendatory paper filed in this case certain clerical errors
are found and the claims are hereby amended as follows:

✓ In claim 10 of the last paper filed, line 1, cancel
the word "separate".

✓ In claim 11, line 5, change "spors" to spots.

✓ In claim 12, line 6, after the word "union" insert,
so as to produce an isolated spot or spots of union.

Respectfully,

O. E. Duffy & Son

Attys. for Applicant.

Div. 3 Room 173

2-280

Paper No. 27

Address only
The Commissioner of Patents,
Washington, D. C.

communications respecting this
application should give the serial number,
date of filing, and title of invention.

Jun. 12, 1911.

DEPARTMENT OF THE INTERIOR

RAJ

UNITED STATES PATENT OFFICE
WASHINGTON

U.S. PATENT OFFICE,
INTERFERENCE DIVISION
JUN 13 1911
MAILED.

Johann Harmatta,

Rietzel
v # 31792.
Harmatta.

C/o O. E. Duffy and Son,

612 F St., N.W. Washington, D.C.

your

Please find below a communication from the EXAMINER in charge of the application of,

183,677, filed Dec. 3, 1903:----

Electric Welding.

31792

E. B. Moore

Commissioner of Patents

The following counts have been added to the above
entitled interference:---

9. The herein described method of uniting two pieces of metal at a number of distinct or separate spots separated from one another by well-defined areas of no union, consisting in applying pressure localized at the spots of desired union, and passing electric current through the pieces from one to the other while confining the flow of current to said spots until the union is effected.
10. The herein described method of uniting two pieces of metal, consisting in passing them together while passing a heating electric current from one to the other and localizing the flow of current and the heating throughout the operation in a spot or spots of circumscribed or limited area as compared with the area of the immediately opposed surfaces so as to limit the union of the pieces to a spot or spots.
11. The improved method of uniting two pieces of metal at a spot or spots only in their opposed meeting surfaces, consisting in pressing the two pieces together, and passing a welding electric current from one to the other while localizing the pressure in and confining the flow of current to the spot or spots of desired union so as to produce an isolated spot or spots of union, leaving distinct or well-defined areas in which the pieces are not welded together.

The preliminary statement required by Rule 110, as to the added counts only, should be filed on or before AUG 14 1911

The relation of the added counts of the interference to the claims of the respective parties is as follows:----

Counts	Rietzel	Harmatta
9	2	10
10	3	11
11	4	12

Wm J Rich
Examiner, Division 3.

Honorable Commissioner of Patents.

Sir:-

In the matter of the pending application for patent of Johann Harmatta, Serial No. 183,677, filed December 3rd 1903, ELECTRIC WELDING, we hereby revoke any and all associate powers of attorney which we may have given in this application and any and all powers to inspect, or other papers which we may have given in this application.

Respectfully,

O. E. Duffy & Son

Attys. for Applicant.

July 30th 1912.

All communications respecting this application should give the serial number, date of filing, and title of invention.

WJR.RAJ

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

WASHINGTON

Oct. 17, 1912

MAILED " " "

Johann Harmatta,
C/o O. E. Duffy and Son,
City.

your

Please find below a communication from the EXAMINER in charge of ~~the~~ application of,
183,677, filed Dec. 3, 1903)-----
Electric Welding.

E. B. Moore.

Commissioner of Patents.

Applicant having prevailed in his interference with
Rietzel (for record see interference file NO. 31,792), this case
has been given further consideration.

The subject-matter of the invention as set out in the
first paragraph of the present specification, should be ampli-
fied in view of the fact that the claims also cover the article
produced by the process claimed.

The word "round", on line 10, page 1 and line 9, page
3, is questioned, since it is ^{not} thought the place of welding would
necessarily be of circular form.

The description of Fig. 1 is thought to be somewhat
involved and it is suggested that it be rewritten.

It is also suggested that "suited", line 14, page 2
be replaced by adapted.

In connection with the claims, an additional examina-
tion of the art has been made and the following patents are
noted as apparently meeting the terms in which certain of the
claims are phrased.

Thomson,	375,022,	Dec. 20, 1897,	219 - 10,
Moxham,	496,890,	May 9, 1893,	" "
Perry,	576,069,	Jan. 26, 1897,	(X. Ref) same class,
Payne and Driven	584,120,	Jun. 8, 1897,	same class,
Kleinschmidt,	616,436,	Dec. 20, 1898,	" "
Brown and Morse,	645,066,	Mar. 13, 1900,	" "
Perry,	670,808,	Mar. 26, 1901,	" "

Thomson (this being one patent from a number showing an analogous operation) discloses the welding together at their ends of two bars A and B, by means of an electric current, the bars being pressed together during the welding.

Moxham shows a similar method of welding bars (rails) at their ends.

These two patents appear to anticipate the terms of claim 2, the expression "at spots only", without some qualification, being of sufficient breadth to refer to ends, and pressure and heating current being localized in said spots (ends).

For a similar reason Payne and Driven and Brown and Morse appear to meet the terms of this claim in their disclosure of the welding of two pieces of metal one on the other. It is noted that in these patents carbon electrodes are employed which would negative the idea of much pressure but as in "welding" it is necessary to employ pressure it is considered that pressure must be employed during the operation. These two patents cover and claim the same thing, they having been involved in an interference.

Perry, 576,069 discloses the electric welding of the joints of a wire fence. It would seem that a wire fence could properly be considered as an article of metal and whether the parts welded be joints of wires or small spots in sheets as in claims 2, 3 and 7, would be patentably immaterial. Accordingly,

this patent appears to meet the terms of such claims.

Fig. 6 of Perry, 670,808, appears to meet the terms of claim 2.

The Kleinschmidt patent, showing the joining of splice bars to rails by electric welding at raised portions (spots?) b, appears to be an anticipation of claims 1 to 12 inclusive.

Inasmuch as the claims of this case have previously been considered allowable and those noted above have been contested in an interference with a patent wherein similar claims were granted, a formal rejection is not now made, since upon consideration and explanation it may appear that the references cited have been formally or informally considered in the examining division earlier having jurisdiction of the applications and held not pertinent. It is thought best, however, to note them in order that if the claims do differ from the patents, such differentiation may appear in the record.

R

Wm. J. Rich

Examiner, Division 3.

1-1-33
APPLICATION ROOM
OCT 25 1912
U.S. PATENT OFFICE

Serial No. 183677
Paper No. 30-
Amendment. K

Div. 3
Room 175

October 23rd 1912.

Hon. Commissioner of Patents,
Washington, D. C.

U. S. PATENT OFFICE,
OCT 26 1912
DIV. 3.

Sir:

In the matter of the application of
Johann Harmatta for Electric Welding filed Dec. 3rd,
1903, Serial No. 183,677;

In reply to the Office letter dated
October 17th, 1912, please erase all previous
specifications, claims and amendments thereto and
substitute the following:

K¹
My invention relates to the manufacture
of metal articles of all kinds and consists in a
novel method of fastening the component parts to-
gether by the process of electric welding and also
in the new article produced thereby.

The invention affords a cheap and prac-
tical substitute for riveting and is particularly
useful in fastening plates or sheets of metal to
one another inasmuch as it may be employed for the
thinner sheet metal, such for instance as is used
for sheet metal ware like vessels or household
utensils.

In general terms the invention may be
stated to consist in fastening the pieces together
by an electric weld at one or more distinct or
well-defined spots, each of small area or extent,
in their juxtaposed or opposite plane faces by the
application of pressure and heating current localized
in such spots, and in the special method of local-
izing the heating and the pressure in the spot or

spots as hereinafter described and specified more particularly in the claims.

It has been before proposed to electrically weld two rods of metal together by a butt-welding process, the area of union effected being substantially coextensive with the cross-section of the pieces at their meeting ends, that is to say, the weld has been made over substantially the whole area of the opposed portions of said pieces. It has also been proposed to make a lap joint between the ends of two strips of metal by electrically uniting them together over substantially the whole area of the lapping surfaces.

A weld formed according to my invention is distinguished however from such prior welds, among other things, by the fact that the opposed surfaces available for uniting the pieces together and in which it might be possible to form a weld are welded in a small spot or spots only, the spot or spots being surrounded by comparatively large areas of opposed surfaces in which no weld is made.

By the term "electric welding" as used herein I mean that wellknown process in which the work is brought to the welding temperature by internal heat generated by the resistance of the work itself to the passage of an electric current at the place of contact between the parts to be joined by the welding pressure, and I disclaim those processes of fastening pieces of metal together in which the parts are heated and practically melted down by an

electric arc generated on the back of the piece by "drawing" an arc by means of the electrode, as well as other processes in which the welding heat is generated externally and electrically in a resistance material and is imparted to the work by heat conduction from said resistance material in contact with the work.

While it is possible, consistently with my invention, to localize the desired pressure and heating current at the desired distinct small spot or area in various ways, this may be accomplished conveniently by pressure applied over the spot and itself localized on the back of the plate or sheet immediately over the small spot in which the union is to be made by using a tool pressed against the work by its end and formed at such end so as to engage the work by a spot or area of small extent and serving, likewise, by preference, as the electrode which feeds the current into the work to heat the same. The member which feeds the electricity being thus at the same time the tool, in this manner the most favorable conditions of working possible are secured, since, as is wellknown, in really effective welding processes the place of welding brought to the proper temperature must be at once well hammered or pressed in order that the welding may be thorough.

For carrying out the new process various apparatus may be employed, as the necessary pressure may be exerted at the place of welding by the aid of any of those technical means which are suitable for producing or transmitting pressure, e.g., with

a press either direct or by means of indirect transmission by levers. Or it may be by means of simple hand levers, that is to say, by means of direct or indirect manual power, or by other means.

In the accompanying drawings, Fig. 1 illustrates the application of my invention to the welding of two plates or sheets overlapped so as to be superposed or have a portion only of their meeting faces presented to one another and by the welding of the opposed surfaces intermittently or at certain spots only through applying pressure at a point or spot on the back of a plate over the spot of desired union.

Fig. 2 is a side elevation of a welding device, also illustrated in part in Fig. 1. It shows the construction of the means which may be employed for pressing the electrode against the work by manual power.

Figs. 3 and 4 show forms which may be adopted for the ends of the electrodes where they engage the work.

Electrodes a, b are by preference both formed to engage the work by a small area of contact and may each be adapted to work on the smallest possible surface contact, so as to localize the pressure and the path of the heating current in a very small spot only. The lower electrode b may be inserted in a conductor c and forms one pole of the heating current, while the upper electrode is carried by an arm d, which can be turned on a shaft

1-10

f by means of a hand lever e, and is connected with the opposite pole of the circuit feeding current to the work. By this means the electrode a may be caused to approach and recede from the electrode b and to exert pressure upon the back of the two superposed sheet-metal pieces introduced between the electrodes for the purpose of welding. The two superposed metal plates to be welded together being in position between the electrodes as indicated in Fig. 1, the operation is performed by firmly pressing the electrode a down upon the work with any required degree of pressure by means of the lever e and the circuit is closed by any suitable means, thus producing a flow of heating current through the work itself substantially localized therein so as to bring the same to the necessary welding temperature at the desired spot only, and the application of pressure by the use of the lever e will result in the welding of the plates together in the small sharply defined place of welding at the point or spot desired, which perfectly answers the purpose of a rivet. In this event, especially in the case of thin vessels which are not required to withstand great pressure, the pressure on the place of welding may at the right moment be exactly regulated or kept within the proper limits. Obviously, the operation may be repeated upon the work at another point if it is desired to join the pieces at a number of spots only.

The time or duration of pressure and heating and the amount of pressure as well as the volume of current for effecting the weld can be

-3-

readily determined by experiment for different sizes or thicknesses of metal and as well understood in the art of electric welding to which my invention relates.

The operation is completed with the cutting off of the flow of current in the usual manner practiced in the art of electric welding and the withdrawal of pressure when desired to permit the work to be withdrawn from position between the electrodes.

Sheet metal work made by this process is readily distinguished from that made by prior processes by the comparative absence of burning, roughening or disintegration of the material on the back of the plate when the operation is carefully conducted. It further possesses the advantage that there are no rivet heads to mar the finish of the back or outer surfaces of the plate.

I am aware that it has been before proposed to fasten two sheets of metal together by electrically welding them over practically the whole area of their opposed or lapping surfaces.

I am also aware of patent to H. F. A. Kleinschmidt No. 616,436, dated December 20th, 1898, and do not wish to be understood as claiming anything disclosed in said patent.

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What I claim as my invention is:-

1. The hereinbefore described improved method of fastening two pieces of metal together by electrically welding them to one another at spots only of their juxtaposed or opposite faces by the application of pressure and heating current localized in such spots.

2. The herein described method of uniting two pieces of metal at a number of distinct or separate spots separated from one another by well-defined areas of no union, consisting in applying pressure localized at the spots of desired union, and passing electric current through the pieces from one to the other while confining the flow of current to said spots until the union is effected.

3. The herein described method of uniting two pieces of metal, consisting in pressing them together while passing a heating electric current from one to the other and localizing the flow of current and the heating throughout the operation in a spot or spots of circumscribed or limited area as compared with the area of the immediately opposed surfaces so as to limit the union of the pieces to a spot or spots.

4. The improved method of uniting two pieces of metal at a spot or spots only in their opposed meeting surfaces, consisting in pressing the two pieces together, and passing a welding electric current from one to the other while localizing the pressure in and confining the flow of current to the spot or spots of desired union so as to

produce an isolated spot or spots of union, leaving distinct or well-defined areas in which the pieces are not welded together.

5. The method of uniting two sheet metal pieces together face to face, consisting in pressing them together, and, simultaneously with the pressure, passing an electric current from one to the other at isolated or distinct spots in the areas lapping or opposed, said spots being separated from one another by such a distance that there is a union of the sheets at spots entirely surrounded by areas of no union.

6. The method of uniting sheets of metal by pressing them together and at the same time passing a heating and welding current from one to the other at a spot on their meeting surfaces which is restricted in area throughout the operation so as to leave on the meeting surfaces a well-defined and comparatively extensive area of no union completely surrounding said spot.

7. The process of electrically welding thin metallic sheets, which consists in introducing the sheet metal parts to be welded between electrodes, pressing said electrodes firmly together and closing the circuit, whereby a small, sharply defined place of welding which answers the purpose of a rivet is obtained, substantially as set forth.

8. The method of electrically welding two plates or sheets of metal together face to face between electrodes, consisting in restricting the area of contact of an electrode with said plates

to a spot, passing a heating electric current from said electrode to the co-operating electrode through said spot to heat the work to welding temperature and applying pressure to the work in line with said spot to effect a welding of one plate to the other.

9. The herein described method of producing a welding temperature in a small distinct spot or point of the opposed surfaces of two plates of metal, consisting in applying pressure at a point or spot only at the back of a plate coinciding with the desired point or spot of welding, while the plates are assembled face to face, to localize the flow of current in the required point or spot in the meeting surfaces and passing an electric current through the plates in the line of the applied pressure to bring the material to welding temperature at the spot of welding by the resistance of the work to the passage of such current.

10. The method of electrically welding a piece of sheet metal at a small distinct spot or point in its plane surface to the face of another piece of metal, consisting in applying pressure at a small point or spot on the back of the sheet to localize the pressure and electrical heating of the work at a spot of electrical contact in the opposed surfaces of said pieces beneath the point of applied pressure, and passing an electric current from one to the other at the said spot of localized electrical contact to produce a welding temperature at said spot and maintaining the localized pressure to effect a welding at said spot.

11. The herein described method of welding two pieces of sheet metal together by a weld at a small spot only of their opposed surfaces, consisting in applying pressure localized in a spot on the back of a sheet directly over the desired spot of union, while said sheet is assembled face to face with the opposite sheet and so as to localize the pressure and electrical heating in a spot in the meeting surfaces of the sheets, and effecting the weld by passing an electrical current from one sheet to the other through said spot in the line of the localized applied pressure, and by pressure applied in said line.

12. The method of electrically welding two pieces of sheet metal to one another, consisting in pressing the sheets together by pressure applied and localized in a distinct well-defined point or spot on the rear surface of a sheet while passing an electric current through them in the line of the pressure, thereby localizing the path of the heating current from one to the other of the meeting surfaces of the sheets to cause the said sheets to be heated to welding temperature by the electric resistance of the work at said spot, and applying pressure localized over said spot whereby the pieces are welded together at a distinct well defined spot in their meeting surfaces answering the purpose of a rivet.

13. The method of electrically welding two plates of metal together face to face, consisting in pressing the plates together between two elec-

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trodes one of which at least makes contact with the rear of a plate at a spot only, feeding a heating electric current into the plates by said electrodes to bring the plates to welding temperature by the heating effect due to the electrical resistance of the portion of the circuit containing said plates, and effecting an electric welding of one plate to the other at a spot beneath the electrode by the pressure of said electrode.

14. The herein described method of fastening two sheets of metal together at a distinct point or spot only in their plane meeting surfaces, consisting in pressing the sheets together and localizing the contact pressure of each upon the other at the said distinct spot or point, passing an electric current from one sheet to the other through said localized spot of contact pressure between them to bring the metal to welding temperature in said spot and thereupon completing the weld in the material so brought to welding temperature and uniting the pieces by a welded union at said spot only.

15. The herein described method of fastening two pieces or sheets of metal together at a spot only in their meeting surfaces, consisting in pressing them together at said spot, passing an electric current through said pieces or sheets at said spot to raise the same to welding temperature and applying welding pressure localized in the back of a sheet immediately over said spot to effect the weld.

16. The herein described method of welding two pieces of sheet metal together by pressing them to-

gether between electrodes engaging the surface of the sheets at a spot only and bringing the section of work between them to the welding temperature by its resistance to the passage of an electric current fed through the work by said electrodes.

17. Metal plates fastened together by a number of distinct or isolated welds on their meeting surfaces and in spots comprising meeting portions of the metal plates, the backs of said plates being practically unaltered in their metallic condition and the spots on the meeting surfaces being separated from one another by distinct unwelded areas.

18. Sheet metal work comprising pieces of sheet metal welded together in the material of their meeting surfaces and in spots only, each surrounded by distinct areas of unwelded union, the back surfaces of said pieces being substantially unaltered over the welded spots, substantially as and for the purpose described.

19. Composite metal work having its component pieces welded together in spots only involving the material of their opposed or meeting surfaces, said spots being each entirely surrounded by distinct areas of unwelded union and the portion of the pieces back of the welds being substantially unaltered, as and for the purpose described.

20. Metal work comprising a metal plate fastened on its surface to the opposed surface of another piece of metal by a weld at a spot only in the material of the opposed surfaces, said spot

being surrounded by a distinct area of unwelded union and the back surface of said plate being practically unaltered over said spot, as and for the purpose described.

21. A metal article comprising two bodies of metal having adjacent plane surfaces united at a plurality of spaced and isolated spots of integral and autogenous welded union, the metal at the spots of welded union having substantially the same qualities as at other points.

REMARKS:

In reply to the official action dated October 17th, the applicant submits the above substitute specification and claims.

Some of the patents now cited by the Examiner were specifically cited in the Rietzel case against the allowance of many of the claims now submitted by applicant and the considerations made of record in the Rietzel application were evidently recognized by the Examiners having charge of that case as rendering those patents inapplicable. As to other patents which the present Examiner now cites for the first time, the same considerations apply forcibly. They were doubtless influential with the Examiner who acted on the Rietzel case and for this reason he did not cite these additional patents whose existence must have been known to him.

The specification as now drawn with its differentiating clauses clearly differentiates the invention from the references. However, we call

the attention of the Examiner to the facts submitted here below which, among many others that might be referred to, establish clearly that this applicant has made a definite advance in this art for which he is entitled to the protection of a patent.

The resemblance between the processes of welding disclosed in the Thomson and Moxham patents and that of applicant is, to say the least, extremely remote. In both those cases the patentees contemplate the formation of a weld not limited to a spot in the opposed or meeting surfaces but the formation of a welded union over substantially the whole area of the metal pieces taken in cross-section and on a line immediately back of the welded union. Welding according to those patents, is, in its essentials, a welding of the whole opposed areas or surfaces. Other patentees, in their attempt to weld plates of metal, followed out the suggestions of the Thomson patent and others in which an end welding of pieces is described, by attempting to weld practically the whole of the plane surfaces of the plates together. In neither case is there anything in the nature of a welding of juxtaposed or opposite faces of the pieces or plates at a "spot" in the ordinary acceptation of the term "spot" and as defined by the dictionary, nor in the sense of the term "spot" as defined in Harmatta's substitute specification submitted herewith. It seems to applicant that the term "spot" has no application whatever to the weld produced by the welding of two bars or pieces of metal end to end over substantially their whole cross-sectional area.

Regarding the Payne and Diven patent, it is quite clear that the patentees contemplated only the union of the plates by a lapped joint involving practically the whole area of the lapping surfaces. There is not a word in the patent about so limiting the area of heating of the metal that the welding temperature will be reached in only a spot in the opposed surfaces.

In the Brown & Morse patent there is likewise an entire absence of any disclosure indicating that the patentees contemplated anything but a union of the strips over practically their whole meeting or opposed surfaces. All the statements made in the specification are consistent with the idea that a union over the whole surface of the plate was the thing in view, as for instance, where the patentees speak of the welding of flat copper bonding strips directly to the rails of electric railways, in which case it is quite obvious that the union should be over the whole surface in order to afford the desired conductivity at the point of junction of the bond and rail.

Furthermore, the Brown & Morse as well as the Payne & Diven process is one in which the metal is brought to the welding temperature by an external source of heat conducted into the metal pieces from the back and which would necessarily diffuse itself over substantially the whole areas of the opposed pieces and so that the localization of the heating to a welding temperature in a spot in the opposed surfaces would be practically impossible.

Furthermore, it is apparent that a welding at a spot in the ordinary sense of the term "welding" as employed in this art is not practical with carbon electrodes, since the electrode, if shaped to exert pressure at a spot, would be extremely liable to break because of its fragile nature.

In short, the Brown & Morse method is not a true electric welding process in the sense of the term "electric welding" as ordinarily used in the art and as defined by this applicant in the body of the substitute specification herewith submitted.

In respect to the Perry fence patent, we can find nothing but a union of the elements of the structure over substantially the whole of the meeting surfaces. To say that there is a welding at spots only, seems to the applicant to employ the term out of its ordinary significance and to imply that the void spaces between the metal portions are to be considered as a part of the opposed surfaces to be welded, which obviously they are not.

The patent to Perry 670,808 presents a method that only apparently resembles applicant's invention and in substance is essentially different therefrom. There is no localization of the welding in a spot only of the opposed surfaces in which a welding might take place. So far as the balls are concerned, the welding contact is at the mathematical point at which the surfaces of two spheres may, geometrically considered, make contact with one another. It would be physically impossible to weld the balls at any other than such point of contact and parts immediately contiguous thereto, so that while in one sense and from a purely geometrical standpoint,

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there is a spot at which the surfaces may touch, nevertheless in the practical sense of the welding of two pieces systematically limited to a spot only in their weldable opposed or meeting surfaces, the idea of applicant and the essence of his invention are totally absent. The same consideration applies with equal force to the mere welding of two crossing wires together at an intersection, provided it be possible to consider such welding, as disclosed in the Perry patent and practiced in actual fence welding, to be a welding in a spot in any sense rather than a substantial welding of all of the meeting sides of the wires where their sides lie against one another.

The Kleinschmidt patent does not disclose the idea of welding at a spot only in the ordinary sense of the term "spot". The Standard Dictionary defines "spot" thus:

1. A particular place of small extent; a definite locality; as, the spot where Columbus first landed.
2. Any small portion of a surface differing in color from the rest.
3. A minute piece or bit; particle; atom.

The patentee Kleinschmidt was dealing with large masses of metal and with a construction in which provision had been made to withstand extreme shearing strain.

For the purposes of the use of the finished production a weld across the whole face of the plate would be desirable, and this the patentee specifically aims at in the union at the place B Fig. 2. For other and specific purposes he modifies the shape of the projection b without idea or purpose of confining the extent of the weld to a "spot". It may be noted

that the cross-sectional view, Fig. 3, shows a welding across the whole face of the plate but independently of this suggestion or any inference to be drawn therefrom it is quite clear that if the weld were or could be confined to the areas represented by the projection b, said projections are so large that there would not be a welding in a "spot" in the usual sense of the term and consistently with what applicant has set out as his invention. To avoid any question, however, as to whether this patent should constitute a bar to the allowance in this case the applicant has specifically disclaimed the said patent by specific reference thereto in the body of his specification.

The above arguments are in conformity with those advanced at great length before the Principal Examiner, Mr. Rich, during numerous interviews had by one of the attorneys in this case, and it has been agreed by Mr. Rich, as the result of such interviews, that the above amendment places this case in condition for allowance.

Respectfully submitted,

JOHANN HARMATTA,

By

O. E. Duffy & Son

1454

ADDRESS ONLY
THE COMMISSIONER OF PATENTS
WASHINGTON, D. C.

K.O'D.

2-181

Serial No. 183,677.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

WASHINGTON Oct. 31, 1912.

Johann Harmatta, Assor.

Sir: Your APPLICATION for a patent for an IMPROVEMENT in
Electric Welding,

filed Dec. 3, 1903, has been examined and ALLOWED.

The final fee, TWENTY DOLLARS, must be paid not later than SIX MONTHS from the date of this present notice of allowance. If the final fee be not paid within that period, the patent on this application will be withheld, unless renewed with an additional fee of \$15, under the provisions of Section 4897, Revised Statutes.

The office delivers patents upon the day of their date, and on which their term begins to run. The printing, photolithographing, and engrossing of the several patent parts, preparatory to final signing and sealing, will require about four weeks, and such work will not be undertaken until after payment of the necessary fee.

When you send the final fee you will also send, DISTINCTLY AND PLAINLY WRITTEN, the name of the INVENTOR and TITLE OF INVENTION AS ABOVE GIVEN, DATE OF ALLOWANCE (which is the date of this circular), DATE OF FILING, and, if assignee, the NAMES OF THE ASSIGNEES.

If you desire to have the patent issue to ASSIGNEES, an assignment containing a REQUEST to that effect, together with the FEE for recording the same, must be filed in this office on or before the date of payment of final fee.

After issue of the patent uncertified copies of the drawings and specifications may be purchased at the price of FIVE CENTS EACH. The money should accompany the order. Postage stamps will not be received.

Final fees will NOT be received from other than the applicant, his assignee or attorney, or a party in interest as shown by the records of the Patent Office.

Respectfully,

E. B. Moore.

Commissioner of Patents.

O. E. Duffy & Son,

Wash. D. C.

IN REMITTING THE FINAL FEE GIVE THE SERIAL NUMBER AT THE HEAD OF THIS NOTICE.

UNCERTIFIED CHECKS WILL NOT BE ACCEPTED.

1455
\$20.⁰⁰ RECEIVED

NOV 5 1912 H.

CHIEF CLERK U.S. PATENT OFFICE

2-327.

MEMORANDUM

FEE PAID AT UNITED STATES PATENT OFFICE.

(Be careful to give correct Serial No.)

Serial No. 183,677

Nov. 4, 1912

INVENTOR:

Johann Harnatta

PATENT TO BE ISSUED TO

Assignees-

NAME OF INVENTION, AS ALLOWED:

Electric Welding

DATE OF PAYMENT:

Nov. 4 - 1912.

FEE:

\$20.⁰⁰

DATE OF FILING:

Dec. 3 - 1903

DATE OF CIRCULAR OF ALLOWANCE:

Oct. 31 - 1912.

The Commissioner of Patents will please apply the accompanying fee as indicated above.

O. E. Duffy & Son

Attorneys

SEND PATENT TO

Attys.

INTERFERENCE.

Interference No. 36709 *Paper No.* 31
Name, Johann Harmatta
Serial No. 183677
Title, Electric Welding
Filed, Dec. 3, 1903 - Patent No. 1046066 granted Dec. 3, 1912
Interference with S. Z. de Ferranti

DECISIONS OF

Primary Examiner, *Dated,*
Ex'r of Interferences, *Dated,*
Board, *Dated,*
Commissioner, *Dated,*

REMARKS:

This should be placed in each application or patent involved in interference in addition to the interference notice by Primary Examiner.

Forwarded from Div. 3 to
Examiner of Interferences.

2-318

Appar. No. 32
[INTERFERENCE]

Oct. 2, 1913

DEPARTMENT OF THE INTERIOR.

WLR/RAJ

UNITED STATES PATENT OFFICE.

WASHINGTON, D. C.

U.S. PATENT OFFICE,
INTERFERENCE DIVISION
OCT 7 1913
MAILED.

C. E. Duffy and Son,
612 F St., N.W.
Washington, D.C.

Please find below a copy of a communication from the Examiner concerning the
patent of Johann Harmatta, for Electric Welding, # 1046066, dated
Dec. 3, 1912, (serial number 183,677 filed Dec. 3, 1903).

Serial No. 175

Very respectfully,

ADDRESS ONLY
THE COMMISSIONER OF PATENTS
WASHINGTON, D. C.

Thomas Ewing

Commissioner of Patents.

36709

The case, above referred to, is adjudged to interfere with others, hereafter specified,
and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before

DEC 1 1913

with the subject of the invention, and name of
party filing it, indorsed on the envelope. The subject-matter involved in the interference is

1. The hereinbefore described improved
method of fastening two pieces of metal together
by electrically welding them to one another at
spots only of their juxtaposed or opposite faces
by the application of pressure and heating current
localized in such spots.

2. The herein described method of uniting
two pieces of metal at a number of distinct or
separate spots separated from one another by well-
defined areas of no union, consisting in applying
pressure localized at the spots of desired union,
and passing electric current through the pieces
from one to the other while confining the flow of
current to said spots until the union is effected.

3. The herein described method of uniting
two pieces of metal, consisting in pressing them
together while passing a heating electric current
from one to the other and localizing the flow of
current and the heating throughout the operation
in a spot or spots of circumscribed or limited
area as compared with the area of the immediately
opposed surfaces so as to limit the union of the
pieces to a spot or spots.

Intef. Harmatta-----2

4. The improved method of uniting two pieces of metal at a spot or spots only in their opposed meeting surfaces, consisting in pressing the two pieces together, and passing a welding electric current from one to the other while localizing the pressure in and confining the flow of current to the spot or spots of desired union so as to produce an isolated spot or spots of union, leaving distinct or well-defined areas in which the pieces are not welded together.

The interference involves your patent above identified, and an application for Electric Welding, filed by Sebastian Ziani de Ferranti, whose post office address is Grindleford Bridge, Sheffield, England, and whose attorneys are Spear, Middleton, Donaldson and Spear, Washington, D. C.

The relation of the counts of the interference to the claims of the respective parties is as follows:--

Counts	De Ferranti,	Harmatta,
1	6	1
2	7	2
3	8	3
4	9	4

W.R.

Wm. J. Rich
Examiner, Division 3.

HARMATTA.
ELECTRIC WELDING.
APPLICATION FILED DEC. 3, 1903.

1,046,066.

Patented Dec. 3, 1912.

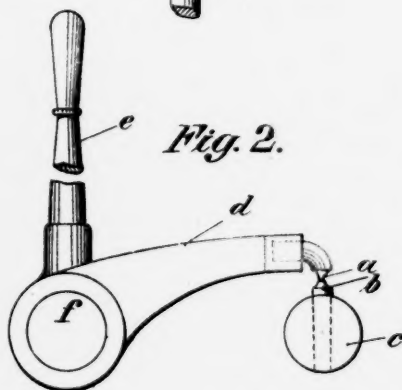
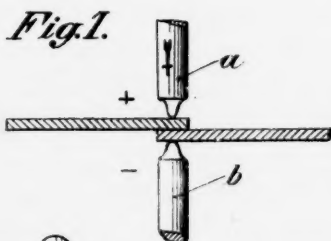


Fig. 3. Fig. 4.



Witnesses:
J. P. Britt
C. C. Duffy

Inventor:
Johann Harmatta
by C. C. Duffy
Attys

UNITED STATES PATENT OFFICE.

JOHANN HARMATTA, OF SZEPESVÁRALJA, AUSTRIA-HUNGARY, ASSIGNOR TO THOMSON ELECTRIC WELDING COMPANY, OF LYNN, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

ELECTRIC WELDING.

1,046,066.

Specification of Letters Patent.

Patented Dec. 3, 1912.

Application filed December 3, 1903. Serial No. 185,677.

To all whom it may concern:

Be it known that I, JOHANN HARMATTA, engineer, a subject of the King of Hungary, residing at Szepesváralja, in the Empire of Austria-Hungary, have invented new and useful Improvements in Electric Welding, of which the following is a specification.

My invention relates to the manufacture of metal articles of all kinds and consists in a novel method of fastening the component parts together by the process of electric welding and also in the new article produced thereby.

The invention affords a cheap and practical substitute for riveting and is particularly useful in fastening plates or sheets of metal to one another inasmuch as it may be employed for the thinner sheet metal, such for instance as is used for sheet metal wire like vessels or household utensils.

In general terms the invention may be stated to consist in fastening the pieces together by an electric weld at one or more distinct or well-defined spots, each of small area or extent, in their juxtaposed or opposite plane faces by the application of pressure and heating current localized in such spots, and in the special method of localizing the heating and the pressure in the spot or spots as hereinafter described and specified more particularly in the claims.

It has been before proposed to electrically weld two rods of metal together by a butt-welding process, the area of union effected being substantially coextensive with the cross-section of the pieces at their meeting ends, that is to say, the weld has been made over substantially the whole area of the opposed portions of said pieces. It has also been proposed to make a lap joint between the ends of two strips of metal by electrically uniting them together over substantially the whole area of the lapping surfaces.

A weld formed according to my invention is distinguished however from such prior welds, among other things, by the fact that the opposed surfaces available for uniting the pieces together and in which it might

be possible to form a weld are welded in a small spot or spots only, the spot or spots being surrounded by comparatively large areas of opposed surfaces in which no weld is made.

By the term "electric welding" as used herein I mean that wellknown process in which the work is brought to the welding temperature by internal heat generated by the resistance of the work itself to the passage of an electric current at the place of contact between the parts to be joined by the welding pressure, and I disclaim those processes of fastening pieces of metal together in which the parts are heated and practically melted down by an electric arc generated on the back of the piece by "drawing" an arc by means of the electrode, as well as other processes in which the welding heat is generated externally and electrically in a resistance material and is imparted to the work by heat conduction from said resistance material in contact with the work.

While it is possible, consistently with my invention, to localize the desired pressure and heating current at the desired distinct small spot or area in various ways, this may be accomplished conveniently by pressure applied over the spot and itself localized on the back of the plate or sheet immediately over the small spot in which the union is to be made by using a tool pressed against the work by its end and formed at such end so as to engage the work by a spot or area of small extent and serving, likewise, by preference, as the electrode which feeds the current into the work to heat the same. The member which feeds the electricity being thus at the same time the tool, in this manner the most favorable conditions of working possible are secured, since, as is well known, in really effective welding processes the place of welding brought to the proper temperature must be at once well hammered or pressed in order that the welding may be thorough.

For carrying out the new process various apparatus may be employed, as the necessary pressure may be exerted at the place of welding by the aid of any of those technical means which are suitable for produc-

ing or transmitting pressure, *e. g.*, with a press either direct or by means of indirect transmission by levers. Or it may be by means of simple hand levers, that is to say, by means of direct or indirect manual power, or by other means.

In the accompanying drawings, Figure 1 illustrates the application of my invention to the welding of two plates or sheets overlapped so as to be superposed or have a portion only of their meeting faces presented to one another and by the welding of the opposed surfaces intermittently or at certain spots only through applying pressure at a point or spot on the back of a plate over the spot of desired union. Fig. 2 is a side elevation of a welding device, also illustrated in part in Fig. 1. It shows the construction of the means which may be employed for pressing the electrode against the work by manual power. Figs. 3 and 4 show forms which may be adopted for the ends of the electrodes where they engage the work.

Electrodes *a, b* are by preference both formed to engage the work by a small area of contact and may each be adapted to work on the smallest possible surface contact, so as to localize the pressure and the path of the heating current in a very small spot only. The lower electrode *b* may be inserted in a conductor *c* and forms one pole of the heating current, while the upper electrode is carried by an arm *d*, which can be turned on a shaft *f* by means of a hand lever *e*, and is connected with the opposite pole of the circuit feeding current to the work. By this means the electrode *a* may be caused to approach and recede from the electrode *b* and to exert pressure upon the back of the two superposed sheet-metal pieces introduced between the electrodes for the purpose of welding. The two superposed metal plates to be welded together being in position between the electrodes as indicated in Fig. 1, the operation is performed by firmly pressing the electrode *a* down upon the work with any required degree of pressure by means of the lever *e* and the circuit is closed by any suitable means, thus producing a flow of heating current through the work itself substantially localized therein so as to bring the same to the necessary welding temperature at the desired spot only, and the application of pressure by the use of the lever *e* will result in the welding of the plates together in the small sharply defined place of welding at the point or spot desired, which perfectly answers the purpose of a rivet. In this event, especially in the case of thin vessels which are not required to withstand great pressure, the pressure on the place of welding may at the right moment be exactly regulated or kept within the proper limits. Obviously, the operation may be

repeated upon the work at another point if it is desired to join the pieces at a number of spots only.

The time or duration of pressure and heating and the amount of pressure as well as the volume of current for effecting the weld can be readily determined by experiment for different sizes or thicknesses of metal and as well understood in the art of electric welding to which my invention relates.

The operation is completed with the cutting off of the flow of current in the usual manner practiced in the art of electric welding and the withdrawal of pressure when desired to permit the work to be withdrawn from position between the electrodes.

Sheet metal work made by this process is readily distinguished from that made by prior processes by the comparative absence of burning, roughening or disintegration of the material on the back of the plate when the operation is carefully conducted. It further possesses the advantage that there are no rivet heads to mar the finish of the back or outer surfaces of the plate.

I am aware that it has been before proposed to fasten two sheets of metal together by electrically welding them over practically the whole area of their opposed or lapping surfaces. I am also aware of patent to H. F. A. Kleinschmidt No. 616,436, dated December 20th, 1898, and do not wish to be understood as claiming anything disclosed in said patent.

What I claim as my invention is:—

1. The hereinbefore described improved method of fastening two pieces of metal together by electrically welding them to one another at spots only of their juxtaposed or opposite faces by the application of pressure and heating current localized in such spots.

2. The herein described method of uniting two pieces of metal at a number of distinct or separate spots separated from one another by well-defined areas of no union, consisting in applying pressure localized at the spots of desired union, and passing electric current through the pieces from one to the other while confining the flow of current to said spots until the union is effected.

3. The herein described method of uniting two pieces of metal, consisting in pressing them together while passing a heating electric current from one to the other and localizing the flow of current and the heating throughout the operation in a spot or spots of circumscribed or limited area as compared with the area of the immediately opposed surfaces so as to limit the union of the pieces to a spot or spots.

4. The improved method of uniting two pieces of metal at a spot or spots only in their opposed meeting surfaces, consisting in pressing the two pieces together, and

passing a welding electric current from one to the other while localizing the pressure in and confining the flow of current to the spot or spots of desired union so as to produce an isolated spot or spots of union, leaving distinct or well-defined areas in which the pieces are not welded together.

5. The method of uniting two sheet metal pieces together face to face, consisting in pressing them together, and, simultaneously with the pressure, passing an electric current from one to the other at isolated or distinct spots in the areas lapping or opposed, said spots being separated from one another by such a distance that there is a union of the sheets at spots entirely surrounded by areas of no union.

6. The method of uniting sheets of metal by pressing them together and at the same time passing a heating and welding current from one to the other at a spot on their meeting surfaces which is restricted in area throughout the operation so as to leave on the meeting surfaces a well-defined and comparatively extensive area of no union completely surrounding said spot.

7. The process of electrically welding thin metallic sheets; which consists in introducing the sheet metal parts to be welded between electrodes, pressing said electrodes firmly together and closing the circuit, whereby a small, sharply defined place of welding which answers the purpose of a rivet is obtained, substantially as set forth.

8. The method of electrically welding two plates or sheets of metal together face to face between electrodes, consisting in restricting the area of contact of an electrode with said plates to a spot, passing a heating electric current from said electrode to the cooperating electrode through said spot to heat the work to welding temperature and applying pressure to the work in line with said spot to effect a welding of one plate to the other.

9. The herein described method of producing a welding temperature in a small distinct spot or point of the opposed surfaces of two plates of metal, consisting in applying pressure at a point or spot only at the back of a plate coinciding with the desired point or spot of welding, while the plates are assembled face to face, to localize the flow of current in the required point or spot in the meeting surfaces and passing an electric current through the plates in the line of the applied pressure to bring the material to welding temperature at the spot of welding by the resistance of the work to the passage of such current.

10. The method of electrically welding a piece of sheet metal at a small distinct spot or point in its plane surface to the face of another piece of metal, consisting in applying pressure at a small point or spot on the

back of the sheet to localize the pressure and electrical heating of the work at a spot of electrical contact in the opposed surfaces of said pieces beneath the point of applied pressure, and passing an electric current from one to the other at the said spot of localized electrical contact to produce a welding temperature at said spot and maintaining the localized pressure to effect a welding at said spot.

11. The herein described method of welding two pieces of sheet metal together by a weld at a small spot only of their opposed surfaces, consisting in applying pressure localized in a spot on the back of a sheet directly over the desired spot of union, while said sheet is assembled face to face with the opposite sheet and so as to localize the pressure and electrical heating in a spot in the meeting surfaces of the sheets, and effecting the weld by passing an electrical current from one sheet to the other through said spot in the line of the localized applied pressure, and by pressure applied in said line.

12. The method of electrically welding two pieces of sheet metal to one another, consisting in pressing the sheets together by pressure applied and localized in a distinct well-defined point or spot on the rear surface of a sheet while passing an electric current through them in the line of the pressure, thereby localizing the path of the heating current from one to the other of the meeting surfaces of the sheets to cause the said sheets to be heated to welding temperature by the electric resistance of the work at said spot, and applying pressure localized over said spot whereby the pieces are welded together at a distinct well defined spot in their meeting surfaces answering the purpose of a rivet.

13. The method of electrically welding two plates of metal together face to face, consisting in pressing the plates together between two electrodes one of which at least makes contact with the rear of a plate at a spot only, feeding a heating electric current into the plates by said electrodes to bring the plates to welding temperature by the heating effect due to the electrical resistance of the portion of the circuit containing said plates, and effecting an electric welding of one plate to the other at a spot beneath the electrode by the pressure of said electrode.

14. The herein described method of fastening two sheets of metal together at a distinct point or spot only in their plane meeting surfaces, consisting in pressing the sheets together and localizing the contact pressure of each upon the other at the said distinct spot or point, passing an electric current from one sheet to the other through said localized spot of contact pressure between them to bring the metal to welding

temperature in said spot and thereupon completing the weld in the material so brought to welding temperature and uniting the pieces by a welded union at said spot only.

15. The herein described method of fastening two pieces or sheets of metal together at a spot only in their meeting surfaces, consisting in pressing them together at said spot, passing an electric current through said pieces or sheets at said spot to raise the same to welding temperature and applying welding pressure localized in the back of a sheet immediately over said spot to effect the weld.

16. The herein described method of welding two pieces of sheet metal together by pressing them together between electrodes engaging the surface of the sheets at a spot only and bringing the section of work between them to the welding temperature by its resistance to the passage of an electric current fed through the work by said electrodes.

17. Metal plates fastened together by a number of distinct or isolated welds on their meeting surfaces and in spots comprising meeting portions of the metal plates, the backs of said plates being practically unaltered in their metallic condition and the spots on the meeting surfaces being separated from one another by distinct unwelded areas.

18. Sheet metal work comprising pieces of sheet metal welded together in the material of their meeting surfaces and in spots only, each surrounded by distinct areas of

unwelded union, the back surfaces of said pieces being substantially unaltered over the welded spots, substantially as and for the purpose described.

19. Composite metal work having its component pieces welded together in spots only involving the material of their opposed or meeting surfaces, said spots being each entirely surrounded by distinct areas of unwelded union and the portion of the pieces back of the welds being substantially unaltered, as and for the purpose described.

20. Metal work comprising a metal plate fastened on its surface to the opposed surface of another piece of metal by a weld at a spot only in the material of the opposed surfaces, said spot being surrounded by a distinct area of unwelded union and the back surface of said plate being practically unaltered over said spot, as and for the purpose described.

21. A metal article comprising two bodies of metal having adjacent plane surfaces united at a plurality of spaced and isolated spots of integral and autogenous welded union, the metal at the spots of welded union having substantially the same qualities as at other points.

In witness whereof I have hereunto signed my name this 5th day of November, 1903, in the presence of two subscribing witnesses.

JOHANN HARMATTA.

Witnesses:

CARL BECKER,
T. LA GUARDIA.

1454

1903

C O N T E N T S:

Print Apr. 5 1910

1 Application _____ papers.

1. Rejection Jan. 9, 1904

2. Sub. Spec. May 14, 1904

3. Rejection Aug. 10, 1904

4. Amd't-A- Nov. 26, 1904

5. Rejection Mar. 30, 1905

6. Amendt B Nov. 17, 1905

7. Rejection Dec. 1, 1905

8. Revocation of Power of Atty. Mar. 23-06.

9. Power of Attorney - Mar. 23-06.

10. Notice of Rev. and Accept. Mar. 26/06

11. Amendt C May 18, 1906

12. Rejection June 7, 1906

13. Amendt D Dec. 3, 1906.

14. Rej. Dec. 15-1906.

15. Amendt E. Dec. 4-1907.

✓ 16. Rej. Jan. 6 - 1908.

✓ 17. Amdt. "F". Jan 6-1909

18. Rejection Feb- 9, 1909

✓ 19. Amdt. "G" Jan. 27, 1910

✓ 20. Rejections (cls sugg) Mar. 22, 1910.

21. Amend't. H Mar. 30, "

✓ 22. Rejection April 11, 1910

23. Intf. Card

T I T L E:

Improvement in Electric Welding

(Class 219-10)

APR 26 1910.

24. Intf. Letter xPat. No. 928,701,

25. Amendment. I-Jan. 7, 1911.

26. Amendment. J-June 8-1911.

27. Intf. Letter JUN 13 1911

28. Revocation of Assn. Atty. Aug. 2, 1912

✓ 29. Letter Oct 17, 1912

✓ 30. Amendment. K- Oct. 25, 1912

31. Intf data

32. Intf letter OCT 7 1913

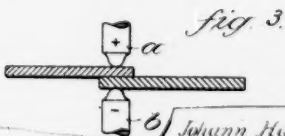
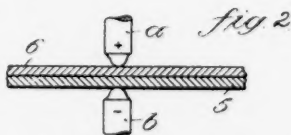
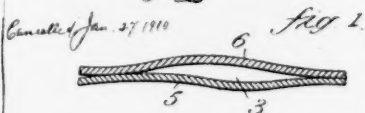
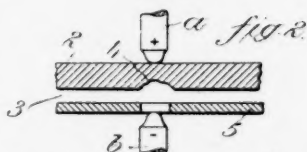
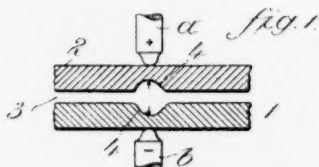
21 Claims

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chb 183,677 Sub. Drawings 183.677/47

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Cancelled May 18 1906.



Witnesses:

asmaesch
John F. Deffernil

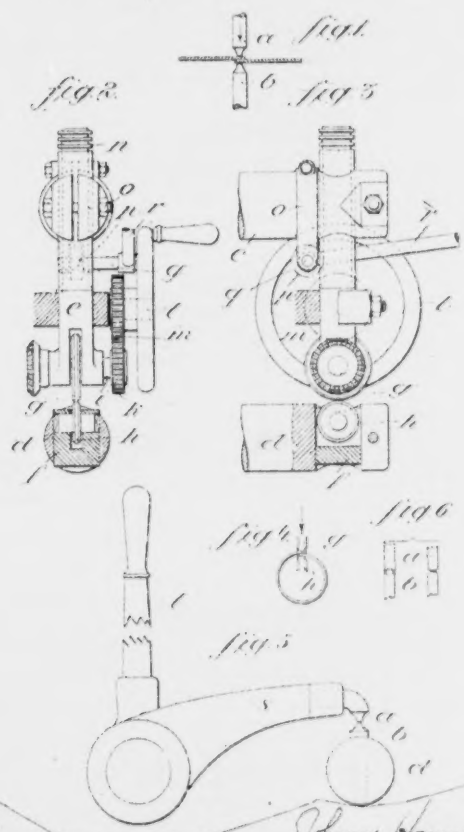
By *Marion Marion*
Johann Harmutta, Inventor,
Attorneys

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Witnesses.
J. Myrland
M. McAlister

Johann Harmatta
Inventor
by Marion Mann
Attorneys

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